the OIL AND GAS JOURNAL
PUBLISHED WEEKLY JUNE 26, 1961

STP good water-flood medicine p. 157

4th annual study of

Pipeline Installation and Equipment Costs p.139

WILL P-E SCHOOLS DISAPPEAR?

Slipping enrollments point up the danger, says Texas U's Dr. Carl Gatlin p. 118

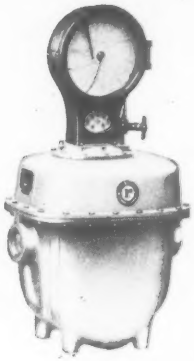
Maritime strike not crippling--yet ▸115

Soviet aid greater menace than cheap oil ▸134

Duramerate, new butane-upgrading process ▸162

No. 10,000
(with Emcorector)

No. 5000



No. 3000
(with Combined
Record Gauge)

No. 1600

**100 PSI
WORKING
PRESSURE**

LARGE CAPACITY ALUMINUM GAS METERS

There's a Rockwell Meter to Fit Every Field Measurement Need

- LEASE ACCOUNTING
- INTER-COMPANY REPORTS
- INTRA-COMPANY SALES
- PIPELINE TAPS
- FIELD PROCESSING
- IRRIGATION FUEL

Rockwell alone can fit all your service needs from the *only* complete line of aluminum meters. These meters are numbered according to capacity ratings. Ratings ranging from 1600 to 10,000 cfh at 4 oz. inlet can be increased substantially by measuring gas at higher pressures—up to 100 psi. Corrections to base pressure are then made with either Emcorectors or Combined Record Gauges.

Rockwell aluminum meters are light in weight—easier to handle and install. Weathering is no problem, neither are the bumps and knocks encountered in the field. Single joint construction means safety—also simplifies access to the inner mechanism which is removable and interchangeable as a unit.

For catalog write Rockwell Manufacturing Co., Dept. 43-F, Pittsburgh 8, Pa. In Canada: Rockwell Manufacturing Co. of Canada, Ltd., Box 420, Guelph, Ont.

ALUMINUM GAS METERS

another fine product by

ROCKWELL

OIL AND GAS JOURNAL
Vol. 59, No. 26

Contents June 26, 1961

THE WEEK'S NEWS

General Interest:
The Maritime Strike: How it Will Affect Oil Industry 115
Journal Interview: Will Petroleum-Engineering Schools Disappear? 118
Coal Interests Say Controversial Senate Gas Bill Is Too Weak 121
Gasoline Tax Revenues Pyramid, And No End Is In Sight 121
Gas Industry Told to Hit Turbine-Generator Market Hard 125
Coal Presses Fight for Curbs on Imports of Gas and Resid 126
Supreme Court Refuses to Review Lower Court Ruling in TBA Case .. 129
Gas-Export Permits Granted in Canada's Medicine Hat Field 130
Humble Stakes a Claim to Esso Brand in Kentucky's Area 132
Perez Alfonzo Confers with Top U. S. Officials 132

Pipelining:
Big New Suwanee Products Line May Get Off the Ground Soon 117
Peace River Oil Pipe Line Will Link System to Eastern Outlets 117
Dixie LPG Line Construction Will Begin Next Month 124
Pipeline Briefs 132

Processing:
West Coast Resid Market Is Expected to Stay Healthy 122
Processing Briefs 130
Jet Air Fleets Are Growing Faster Than Expected 130

Drilling-Production:
New British Columbia Crude Line May Spur Drilling Activity 128
Texas Keeps 8-Day Production Pattern for Third Month 131
Pembina Water Flood Must Continue, Alberta Board Rules 133

Foreign News:
Soviet Oil Aid Programs May Be Greater Menace Than Cheap Crude .. 134
Russian Drillers Find Oil in India 136
American Independent Will Build Rhodesian Refinery 136
German Cities Plan to Build 200-Mile Gas Line 138
Foreign Drilling Maintains High Level 138

Exploration:
Rocky Mountain Exploration Center Shifts in Two Directions 237
Part II: Good Practices Are Key to Successful Oil Finding 240
May Well Completions 254

REGULAR FEATURES

Advertisers' Index ... 267
Calendar of Events .. 102
Classified Advertising. 263
Drilling Contractors .. 233
Drilling Statistics 259
Editorial 113
Equipment Men 228
Exploration Highlights 237
Foreign News 134
Journally Speaking ... 109
Markets 262
New Equipment 215
Personals 255
Pipeline Construction . 183
Process Costimating .. 153
Processing Notes 176
Production 260
Refining Statistics ... 261
Statistical Summary .. 258
The Journal Said 109
They Say 98
Trade Literature 226
Watching Washington. 127
Who's Who in Oil ... 255

Technology-Operation section on next page →

The Oil and Gas Journal is published weekly by The Petroleum Publishing Co., 211 S. Cheyenne, Tulsa 3, Okla. Second-Class postage paid at Tulsa, Okla. Copyright 1961 by The Petroleum Publishing Co. United States and foreign rates to the petroleum industry, 1 year $6, 2 years $9, 3 years $12.

SPECIAL SECTION

PIPELINE COSTS: Installation and Equipment 139
By John P. O'Donnell
Pipeline companies are becoming increasingly cost conscious. Gas-company net income has been rising steadily but at a slower rate than investment. The result has been a slow but steady erosion of rate of return. Oil pipelines have increased efficiency, as measured by productivity per employe, more than 50% since 1953. Despite this vast improvement, return per unit of volume has not changed.

Six sets of tables in this special section review many pipeline costs as they apply to construction: (1) current pipeline costs; (2) complete compressor station costs; (3) yearly changes in pipeline cost; (4) estimated current compressor-station costs; (5) variations in compressor station costs and (6) individual pipeline projects.

TECHNOLOGY—OPERATION

Refining-Processing

Process Costimating—97 153
Capital expenditures in the refining industry.

Pure's New Butane Isomerization Process 164
By Hillis O. Folkins and Elmer L. Miller
The new Butomerate process is centered around a newly developed solid catalyst which has high activity at low temperatures. With this catalyst, n-butane is selectively isomerized to iso-butane at near equilibrium yields.

Metal Contamination up Slightly in Cracking Catalysts 168

Processing Notes 176
Coking will stay around despite growing coke piles—New sleuth detects faulty fuel combustion—New device mixes gas streams at constant ratio—Demand for low-density polyethylene appears headed for decline.

Accident Rate Reduced by Committee Action 178
By J. N. Kayser and R. W. Williams
Experience since 1947 at Humble's Baton Rouge refinery shows that effective safety committees can make the refinery a safer place to work. These committees review startup, shutdown, and emergency procedures; review accidents and near accidents; develop guides for handling flammables; and review operating problems, design, and plant layouts.

Drilling-Production

Low-Cost Water-Flood Treatment with STP 156
By Robert T. Johansen, Raymond J. Heemstra, and Loy Hembree
Sodium tripolyphosphate may be the answer to the problem of improving injection rates in floods where injection-well plugging and corrosion occur. Economical agent means increased injection rates with decreased injection pressures.

Oil-Well Pumping—45 160
By Joseph Zaba
Subsurface hydraulic pumping.

Use Great Care in Handling High-Strength Tubular Goods 170
By John A. Casner
High-strength casing and drill pipe not only cost more, but failures with them are also more costly. You can lower costs if you know what pipe inspection can do.

Pipelining

Pipeline Construction Report 183

THE OIL AND GAS JOURNAL **Newsletter**

June 26, 1961

Significant this week

The maritime strike isn't crippling the oil industry.

Several refineries were closed by picketing, and others were shut down by strikers—but East Coast consumers have been getting plenty of oil products.

Expected: A long-drawn-out dispute (p. 115).

Individual oil firms will be hurt, but it would be some time before the industry's ability to meet demand would be damaged seriously.

Among early strike effects: Sinclair cut its U. S. crude purchases 50%, and Gulf trimmed its buying in South Louisiana.

Pipeliners are growing more cost conscious.

And with good reason. They've made tremendous gains in operating efficiency, but income hasn't matched the showing.

Oil pipeline companies' return per unit of volume hasn't changed since 1953. Gas pipelines' net income has risen—but at a slower pace than investments.

Some key phases of pipeline economics are spelled out in the Journal's fourth annual study of this kind (p. 139).

Speaking of pipeline construction:

Work on 1,077-mile Dixie LPG line across southeastern part of U. S. will begin next month (p. 124).

Last week, companies interested in long-discussed Suwanee products pipeline held meeting to clear tracks for a go-ahead on the project. Decision's expected soon.

New line would serve roughly the same area as Plantation Pipe Line, which runs from Baton Rouge, La., to Greensboro, N. C. (p. 117).

And in Canada, Peace River Oil Pipeline is planning a 160-mile extension of its system to Edmonton.

Gas turbines may kick off new "billion-dollar" industry.

That's what 148 delegates to Southern Gas Association seminar in Houston were told last week (p. 125).

Purpose of seminar: To promote use of gas-turbine units in providing heat, light, and cooling for commercial buildings and schools.

Petroleum engineering classrooms everywhere have more empty chairs these days, and that's not the worst of it.

Some of those classrooms may close.

Continued decline in enrollments could wipe out many petroleum engineering courses in schools which have poured new talent into oil industry for years.

That conclusion's backed up by Dr. Carl Gatlin, chairman of petroleum engineering department at University of Texas (p. 118).

Among things that hurt oil's public image, in Gatlin's view: Texas' 8-day allowables.

He says some persons think this means Texas wells are producing at only 25% of normal rates.

But the Railroad Commission is continuing its string. July allowable is 8 days—for third straight month (p. 131).

A 400-to-500-well drilling program will stem from a new pipeline in British Columbia.

That's the belief of Frank M. McMahon, president of Westcoast Transmission. His company will operate the 505-mile 12-in. line which is now under construction (p. 128).

The $35-million pipeline will hook up previously isolated British Columbia fields with Vancouver refineries. It's the biggest stimulus yet for exploration in the province.

Drilling spotlight in southeastern Rockies province has swung away from Denver basin for first time in 12 years.

Scout reports show how basin has slipped: 57% of all wildcat and field drilling in eastern Colorado centers now in southeastern corner of state, and 52% of Nebraska drilling in that state's southwestern corner (p. 237).

Reasons for shift include drilling success, multiple-pay prospects, plenty of available acreage, label of "independent's country."

Resid fuel oil demand on West Coast should be brisk for at least a couple of years.

Energy needs in District 5 are growing fast. And big new supplies of natural gas aren't expected to put any major squeeze on resid.

Trends in area: Resid yield patterns have been changed to balance output and domestic demand, bonded fuel-oil imports are on the rise (p. 122).

Russian drive to help underdeveloped countries find and use oil could turn out to be more dangerous than cheap Soviet crude.

Latest move: Group of top Russian exploration people is in Karachi to sign contracts for Soviet-financed hunt for oil

in Pakistan (p. 134).

Say the Russians: We don't want your oil, but we'll help you find it. That sounds good in nations where propagandists have sold the idea that western oil companies are exploiters.

News in the making

Mohole project is shooting for a $4-million budget this year. Aim: Construction of an "intermediate" vessel designed specifically for ultradeep drilling.

Within 3 years, project director Willard Bascom hopes to launch another vessel which will do actual drilling into the earth's mantle. Major problem yet to be solved: Re-entry into the hole when the bit is withdrawn.

Look for natural gas to hang onto its important role in steel industry's improvements of open-hearth process.

Size of role is pointed up by jump in gas deliveries to steel plants. Deliveries shot up 80% in 5-year period ending in 1959—hitting 324 billion cubic feet a year.

Natural gasoline may soon get a tax break.

For years it has borne the burden of automotive gasoline tax. But a rider attached to the Senate-approved highway bill would exempt from the gasoline tax all natural gasoline to be used in making petrochemicals. Bill faces a conference committee soon, but the industry is optimistic over the outcome.

Oil demand in Canada will be helped by an estimated 4% increase in gross national product.

Even though climb of this size is rather modest for Canada, it's proof that nation's economy has started shaking off a slump.

Gasoline consumption in Pennsylvania dropped 25% in the first month of the state's new 7-cent gas tax.

Rise in tax was 2 cents.

State tax report for April shows only 207,682,912 taxable gallons, compared with 276,616,217 gallons for April of last year. Drop from March 1961 figure of 310,661,555 gallons was 33%.

Outlook is for continued soft LPG prices on Gulf Coast.

Prices are staying soft because of high stocks caused by mild winter in midwestern states and slack petrochemical demand. Add to that—more gas-liquids plants will be starting production in Gulf Coast region.

Market memo

June 26, 1961

Impact of the maritime strike on Gulf Coast marketing can't be assessed yet.

But last week saw quarter-cent rise in all grades of Gulf Coast gasoline on strength of a possible shortage due to the strike.

Length of strike will be a major factor in area situation (p. 115).

Except for a few scattered price wars, retail gasoline prices in top marketing areas of the interior were **fairly steady** last week.

On the wholesale market, Group 3 gasoline was posted at 12.50 cents a gallon. Unbranded spot sales have been hanging around 12.25 cents.

Premium gasoline has been **showing strength** in some areas. Some pipeline-grade premium has been moving at 2.50 cents over prices quoted for regular.

The wacky Charlotte, N. C., market **reached its wacky extreme** last week: Two suppliers were paying their dealers 1.5 cents a gallon to take gasoline off their hands.

Most major suppliers didn't go that far. They charged dealers a tankwagon price of one-half cent a gallon for regular. With 11 cents tax, retail prices were 13.9 for regular and 15.9 cents for premium.

This **marked the climax** of a price war that has raged off and on in Charlotte area since the start of May, when Sun began selling nine grades.

Later in the week, prices started rebounding. By the middle of last week, Esso—the leading marketer—had raised dealer tankwagon prices to 14.2 cents and dealers were selling at 29.9 retail. So-called normal wholesale price in the area is 15.8 cents.

Humble has asked a Mississippi federal court to **grant it the right** to sell Esso products in Standard of Kentucky's territory (p. 132).

In a bold move, it asks that Kentucky be prohibited from using the Esso mark except under agreements between itself and Jersey Standard.

Marketing notes: Signal Oil & Gas has **bought an interest** in Billups Western Petroleum Co., Greenwood, Miss. Signal bought 980,000 shares of the marketing firm's convertible preferred stock for an undisclosed sum from W. L. Billups, company president, and the Sanders interests of Greenwood and Hammond, La. Deal involves less than half of voting stock in the firm, which operates some 220 service stations in Mississippi, Louisiana, Texas, Missouri, Alabama, and Tennessee.

More than half of the 1,200 code scanners BP Canada is buying to lick a credit-accounting bottleneck have been delivered. Optical code scanners in service stations convert invoices into automated data-processing input for use in company's Toronto central accounting office. System eliminates need for individual key punching and thus cuts cost.

LONE STAR

THE BEST LIFE INSURANCE A WELL EVER HAD

Tradenames Property of Lone Star Cement Corporation, New York 17, N. Y.

LONE STAR

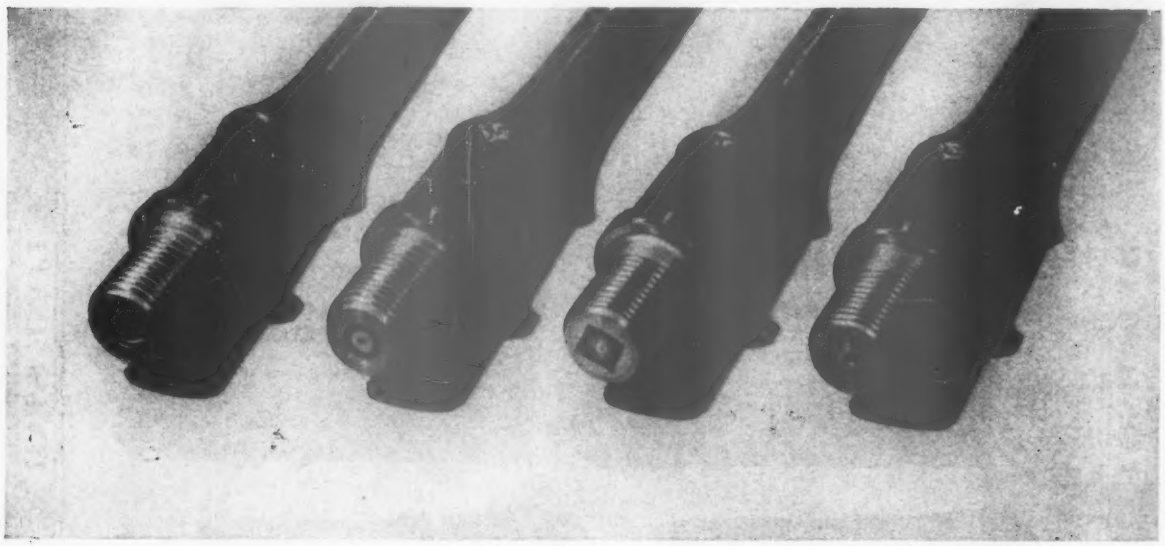
LONE STAR

LONE STAR

For economical pumping choose from four Bethlehem rods

Steel

for Strength . . . Economy . . . Versatility



These four types of Bethlehem sucker rods will handle a wide range of pumping conditions. You can count on them for long service because each rod is manufactured by modern methods, and is carefully inspected at several stages in the process.

To facilitate handling, Bethlehem sucker rods are shipped in a specially designed package containing 100 or 80 rods, depending on their size. Steel spacers separate the rods just enough to prevent contact with each other, thus protecting against damage in transit.

Should you have questions about the specific use of each rod, please call or write the nearest Bethlehem office. Or write to us at Bethlehem, Pa.

ROD	TYPE	HEAT TREATMENT	YIELD POINT psi		TENSILE STRENGTH psi	
			Min.	Av.	Min.	Av.
X2	Carbon-manganese	Normalized	65,000	72,000	93,000	100,000
X Mayari	Nickel-chromium	Normalized	60,000	65,000	90,000	95,000
46	Nickel-molybdenum	Normalized and tempered	67,000	75,000	82,000	90,000
41	Manganese-chromium molybdenum	Normalized and tempered	100,000	110,000	120,000	130,000

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Sales: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

Rubber calms the shudders that used to shorten pump life

DESTRUCTIVE vibration from a pounding mud pump is completely absorbed by B.F.Goodrich mud pump suction hose. As a result, both the hose and the pump last longer.

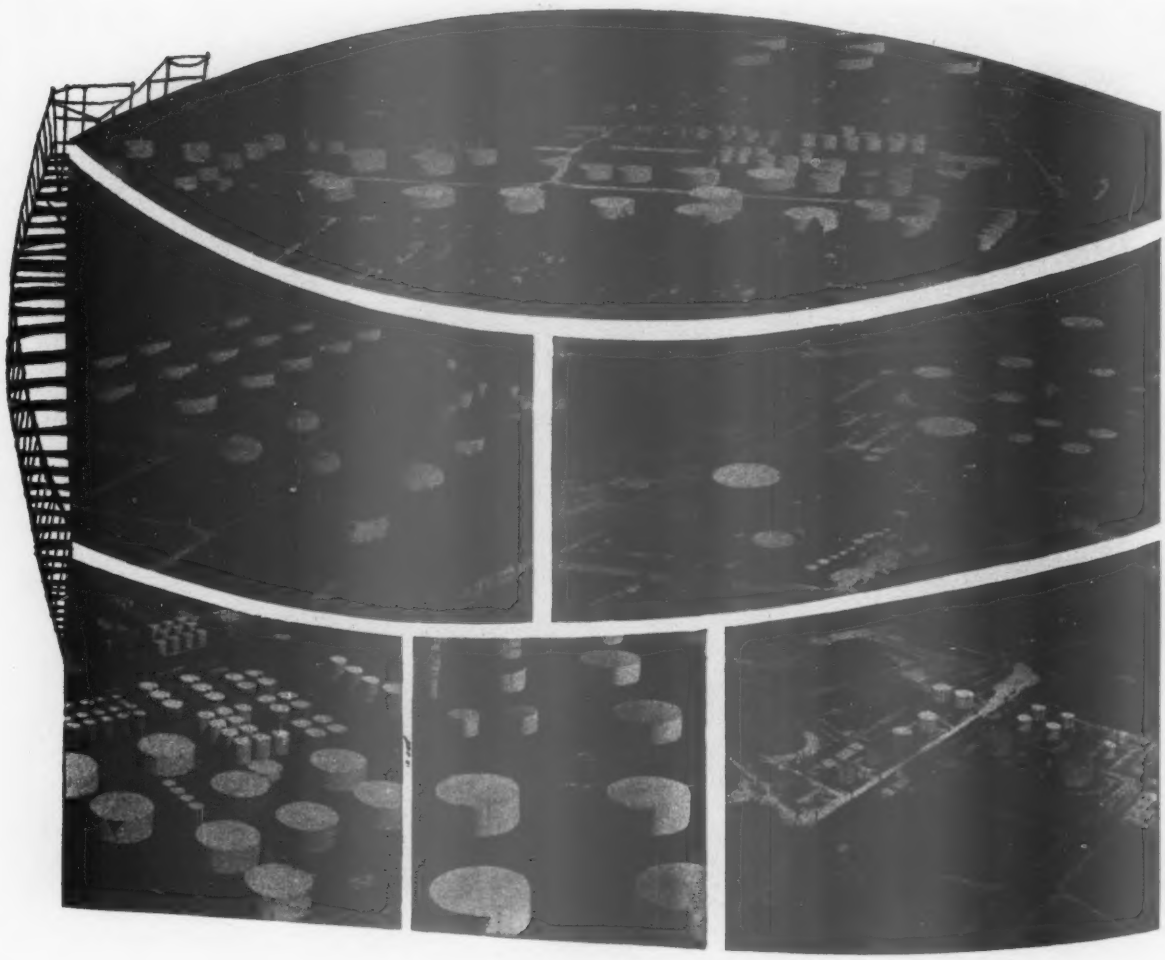
To deaden vibration, B.F.Goodrich engineers made the hose more flexible. Rayon cord is used for reinforcement, rather than the stiff, wrapped plies of fabric found in ordinary hose. The cords run parallel with no cross threads to tie them together, are completely surrounded by rubber. They are free to "give" and absorb the destructive shaking action of the mud pump.

For protection against abrasive mud, the tube of this hose is made of a special compound that outwears steel. It is oilproof, has a smooth surface so mud flows through at high speed.

This BFG hose is built to take full vacuum. A spiral of heavy spring steel wire, imbedded in the hose, prevents collapse, increases crush resistance.

You'll find B.F.Goodrich mud pump suction hose at leading supply stores in the oil field, or at any of these B.F.Goodrich warehouses: Los Angeles, Great Bend, New Orleans, Shreveport, Hobbs, Oklahoma City, Tulsa, Corpus Christi, Dallas, Houston, Odessa. *B.F.Goodrich Industrial Products Co., Dept. M-126, Akron 18, Ohio.*

B.F.Goodrich



YOURS TO USE

Control Your Marketing Costs With General American Tank Storage Terminals

Your lease of General American Tank Storage Terminals facilities protects your profits by keeping your storage costs at the lowest possible level. If storage costs rise, you are protected, and you are never saddled with long-term amortization of large capital investment.

GENERAL AMERICAN TRANSPORTATION CORPORATION

Terminals Division — 135 South LaSalle Street • Chicago 3, Illinois

Terminals at: Carteret, N. J. (Port of New York); Chicago, Illinois; Corpus Christi, Texas; Pasadena, Texas (Port of Houston); Galena Park, Texas (Port of Houston); Good Hope, La. (Port of New Orleans); Offices in principal cities

Inserting 3-inch pipe made of MARLEX (lengths previously joined by butt-fusion) through old 6-inch steel pipe. Insert photos show new 2-inch main with joined 1-inch service (also MARLEX) . . . and butt-fusion rig with completed joint.

Union Gas System, Inc., installs pipe made of MARLEX*. . . joining costs 83% less than steel

Union Gas System, Incorporated, Independence, Kansas, has recently replaced some 10,000 feet of leaking and corroded steel gas lines with pipe made of MARLEX high density plastic. The job was done with much of the MARLEX pipe inserted through existing steel lines—in Skiatook, Oklahoma, and Caney and Coffeyville, Kansas.

Mr. Forrest Martin, District Superintendent, says, "these installations with MARLEX pipe have really been an eye opener for our company. In pulling through old lines, we installed 1500 feet in four hours at Caney . . . and 3040 feet in even less time at Coffeyville." He adds, "In a time study, we found that two men with a butt-fusion rig joined 800 feet of MARLEX pipe and installed several service "T's" in four hours. The same job with steel pipe and welded joints would have taken four men at least 12 hours . . . *conservatively an 83% reduction in joining costs with MARLEX pipe and fittings using the companion butt-fusion process.*"

Mr. Martin concludes, "MARLEX pipe and butt-fusion should really revolutionize gas distribution! There is the expectation of an almost indefinite, corrosion-free service life . . . and the pipe itself is inexpensive, lightweight, easy to handle and install."

In addition to being lightweight, coilable and straight lengths of pipe made from MARLEX TR-212 (ASTM Type III polyethylene) possess excellent load bearing characteristics and a wide usable temperature range. This pipe is also virtually indestructible . . . resistant to solvents, acids, alkalies, oils, bacteria, rot and fungi.

*MARLEX is a trademark for Phillips family of olefin polymers.

For more information, see your pipe supplier . . . or contact us.

PHILLIPS CHEMICAL COMPANY

Bartlesville, Oklahoma

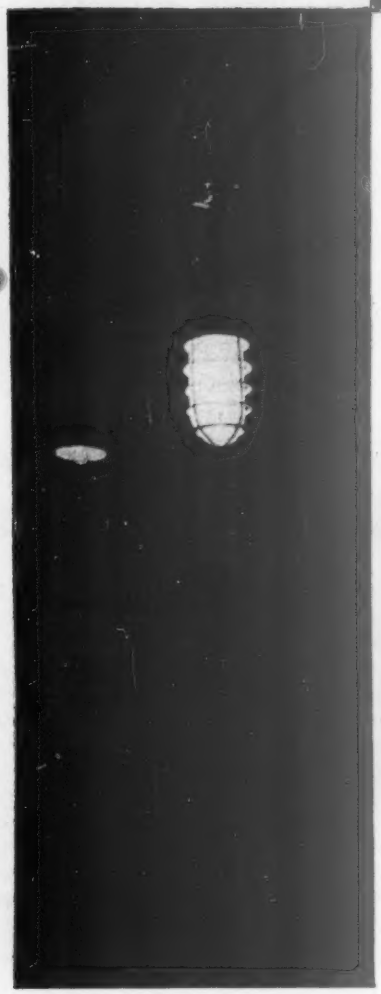
A subsidiary of Phillips Petroleum Company

PHILLIPS 66 MARLEX PLASTICS

LIGHT

exactly where you need it...

Crouse-Hinds Explosion-Proof Lighting Fixtures in Class I, Group D location



regardless of surrounding atmosphere!

When there's something in the air — explosive gases, ignitible dusts, corrosive fumes — Crouse-Hinds has exactly the light to give you lighting exactly where you need it — with complete safety!

Lighting that's safe to operate in explosive concentrations of acetylene . . . hydrogen . . . gasoline vapors . . . organic, inorganic or metallic dusts. Lighting that stands up under the corrosive attack of acids, salts, alkalis.

What *kind* of lighting do you need: Bench . . . area . . . flood? Incandescent . . . fluorescent . . . mercury vapor? Permanent . . . portable?

You'll find them all in the Crouse-Hinds catalog. It's the *only* place you'll find lighting for every Class and Group under the National Electrical Code.

Ask your Crouse-Hinds Distributor.

Crouse-Hinds Dust-Ignition-Proof Lighting Fixtures in grain elevator — a Class II, Group G location

Crouse-Hinds Vaportight Lighting Fixtures in a corrosive outdoor location

CROUSE-HINDS COMPANY SYRACUSE NEW YORK

OFFICES: Atlanta Baton Rouge Birmingham Boston Buffalo Charlotte Chicago Cincinnati Cleveland Corpus Christi Dallas Denver Detroit Houston Indianapolis Kansas City Los Angeles Milwaukee New Orleans New York Omaha Philadelphia Pittsburgh Portland, Ore. St. Louis St. Paul Salt Lake City San Francisco Seattle Tulsa Washington
RESIDENT REPRESENTATIVES: Albany Baltimore Reading, Pa. Richmond, Va.
Crouse-Hinds of Canada, Ltd., Toronto, Ont. Crouse-Hinds-Domex, S. A. de C. V. Mexico City, D. F. Peterco, Sao Paulo, Brazil

A BETTER WAY TO RUN CASING

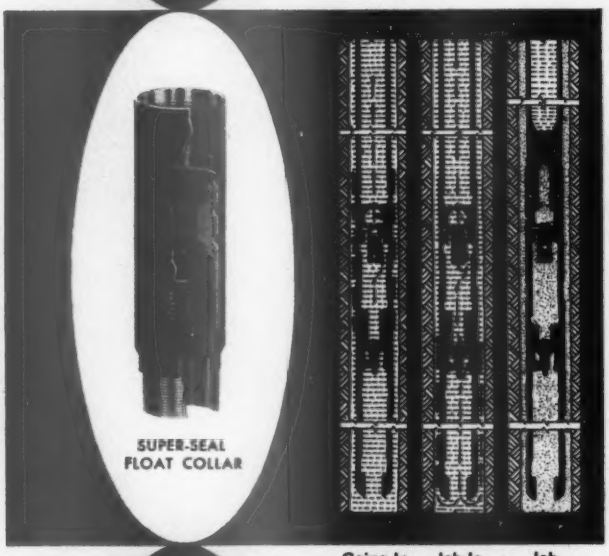
FILL IT

WHILE YOU

RUN IT

. . . AUTOMATICALLY

Now you can put an end to expensive rig time lost while filling casing from the surface on run-in. How? With this efficient Halliburton Tool Team –



- Make up your casing string using a Halliburton Cement Guide Shoe on the bottom . . . a Super Seal Float Collar one or more joints above it . . . and a Self-Fill Differential Collar still further up the string.
- The strong, durable Guide Shoe will help direct the casing away from ledges to minimize side-wall caving and aid in passing shoulders and other obstructions in crooked holes.
- The increasing load on the derrick will be greatly lightened by the use of the Float Collar. The efficient Super Seal valve in this tool is designed to seal off further fluid entry above it inside the casing . . . providing the floating effect.
- The Self-Fill Differential Collar is designed to help maintain a nearly balanced fluid head both inside and outside the casing above the Float Collar. A differential valve in this tool admits fluid from the annulus into the string through side ports in the tool, permitting this fluid to automatically fill the casing above the Float Collar. The valve closes when circulating fluid (or cement) down the casing, preventing leakage into the annulus at this point.
- At the completion of the cementing job, the fill-up tool is closed by pump pressure applied after the top cementing plug has landed. If it is necessary to close the tool prior to this time, a weighted plastic ball (furnished) may be dropped to its seat in the tool for the purpose of closing the fluid entry ports.

HALLIBURTON WELD-A . . . Halliburton's popular thread compound . . . is excellent for use in making up the tools and the casing joints near the bottom of the string where tight connections are a *must!* It's easier, faster – and actually ***stronger than tack welding.***

USE THIS COMBINATION OF HALLIBURTON CEMENTING TOOLS ON YOUR NEXT COMPLETION JOB . . . NO MATTER HOW DEEP THE WELL!

CEMENTING SERVICES

Halliburton
COMPANY • DUNCAN, OKLAHOMA

J.L

SUPPLY

Quality checks pay

off on the right-of-way

Additional Jones & Laughlin tests and advanced mill practices guard the quality of J&L line pipe. The pipe is easy to bend, line up, and weld.

Ask for technical data and prices on J&L line pipe, Rockwell plug valves, and Taylor Forge welding fittings. If it's sold by J&L it's the best available. Call your local J&L Supply man—or write us at Tulsa, 1423 Sheridan Rd.

Jones & Laughlin Supply Division—Tulsa

Are your costs too HIGH?

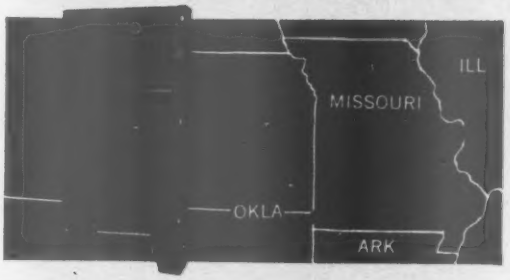
These pipeliners are cutting costs – using SIE control systems

DISPATCHERS CONSOLE used by Cherokee Pipe Line Company for automatic control of liquid line.

SIEMARC Supervisory Systems provide automatic monitoring and remote control for many industrial operations and processes including the petroleum installation pictured. Measuring, data gathering, telemetering, logging, display, indicating and computing are all integrated in the system. Both solid-state and relay components are used as dictated by proper engineering design. Transistors and semiconductor diodes are utilized in all high-speed switching and logic circuits including encoders, decoders, analog-to-digital converters, deviation detectors and magnetic drum circuitry. Separate electric logging typewriters record data and alarms.

POWER LEVEL CONTROLLER used by Shell Pipe Line Corp. Ozark System for maximum pumping station operating economy.

Completely unattended operation of a multi-unit pumping station is possible with Power Level Controllers used by Shell Pipe Line Corp. The unit accepts signals from flow and pressure pickups and makes logic decisions to bring proper combinations of pump units on or off stream automatically. It may be connected to the supervisory control system to permit reset of power levels from a central office dispatching console.

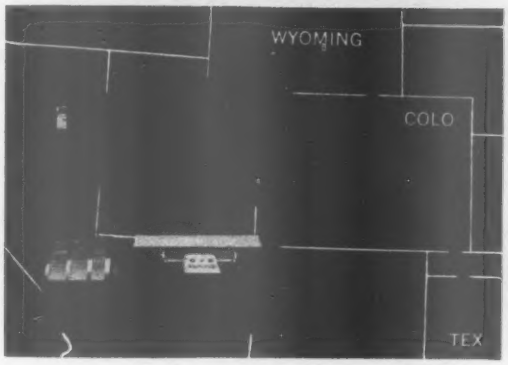


COMPRESSOR STATION CONTROL CONSOLE including complete engine control equipment for automatic station operation and safety.

For gas transmission automation, the basic SIEMARC system can be coupled with Log-Alarm Shutdown and Engine Control-Sequence units. Building block design throughout allows SIE to fit your needs exactly.

DISPATCH PANEL used by Colorado Interstate Gas Company.

In the Colorado Interstate Gas Company installation shown, dispatchers transmit only desired discharge pressure settings; automation at each compressor station responds by maintaining the selected value for optimum station economy. If communication links fail, local automation operates without interruption. Log-Alarm units insure station safety. Dispatchers are alerted only when trouble occurs.



Pioneers in solid state systems for supervisory control and telemetering.

DAY | NIGHT | SERVICE
Call: SUnset 2-2083
Houston, Texas

DRESSER ELECTRONICS

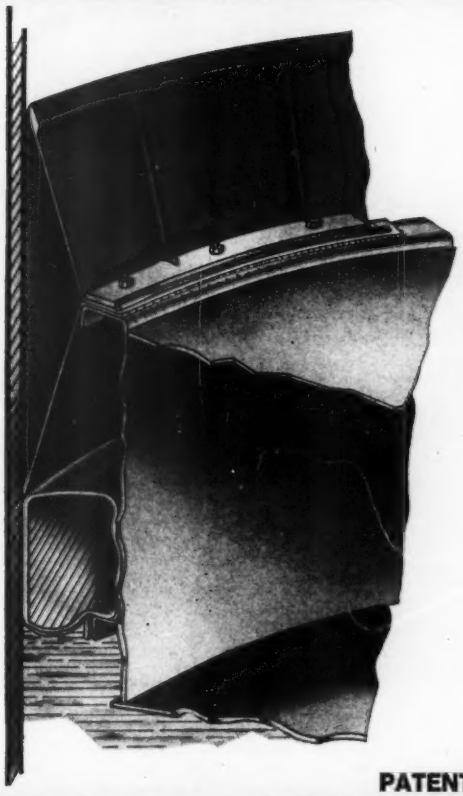
DIVISION ONE OF THE DRESSER INDUSTRIES

10201 Westheimer, Houston 42, Texas

The first volume in a series on how SIE handles supervisory control and automation for the petroleum industry is now available. The booklet gives the ABC's of land line codes, binary techniques — and many more of the basics. A letter brings you "The ABC's of Industrial Telemetering."

ALL FLOATING ROOF TANKS ARE FULLY EQUIPPED, **BUT...**

Only Tubeseal Has Lightning-Proof, Electro-Conductive Weather Shield



PATENTED

Tubeseal electro-conductive weather shields are an *exclusive tried and proved development.* They provide positive protection against lightning-caused rim fires. ■ How? By maintaining a *continuous* grounding bond between roof deck and shell—concentration of static charges is impossible. There has *never* been a lightning fire where any of the many hundreds of Tubeseal System Floating Roof Tanks are installed throughout the world—they're "lightning proof." ■ This is scientific and safe storage protection for the entire range of volatile products. Tubeseals can be installed on any of your tanks—new, old, riveted, or welded. You owe it to the future safety of your conservation facilities to investigate. Send for the Tubeseal Bulletin now—it could be important.

PDM

Pittsburgh-Des Moines Steel Company

12 plants to serve you coast to coast

HAMONDTANK

PITTSBURGH, WARREN, BRISTOL, PA. • BALTIMORE • BIRMINGHAM • DES MOINES
PROVO, UTAH • CASPER, WYO. • SANTA CLARA, FRESNO, STOCKTON, CALIF.

Sales Offices: Atlanta 5 • Baltimore 26 • Boston 10 • Bridgeport 5 • Chicago 3 • Dallas 1 • Denver 2 • Des Moines 8 • El Monte • Fresno • Jacksonville • Los Angeles 57 • Newark 2 • New York 17 • Pittsburgh 25 • Sacramento • Santa Clara • Seattle 1 • Stockton licensees and sales offices in many foreign countries including Argentina, Chile, Australia, Belgium, Brazil, Canada, Colombia, England, France, Haiti, India, Italy, Japan, Mexico, Netherlands, Peru, Puerto Rico, Sweden and W. Germany.

Transwestern Pipeline Company uses Foxboro T/37 "dry" meter and temperature recorder to log gas purchased from Parsell Field, Texas, well.

wet gas, line surges, the weather... nothing upsets Foxboro "dry" flow meters

All Foxboro T/37 Meters have specially-formed diaphragm discs with solid metal spacer rings. Diaphragm assembly can't be damaged by overrange, line surges, or winter freeze-ups.

You'll find Foxboro T/37 Flow Meters on gas wells and gathering lines all over the Texas Panhandle... including many of those owned by Transwestern Pipeline Company—America's newest supplier of natural gas.

Since Panhandle gas normally contains a high amount of liquid hydrocarbons, the T/37 is a "natural." There is no mercury to clean or replace. Maintenance is kept to a minimum. In addition the T/37 is completely free from zero drift and ambient temperature effects . . . resulting in the highest sustained accuracy of gas flow measurement.

No wonder both pipeliners and producers are high in their praise for the Foxboro T/37. Mercury-less—accurate—almost indestructible, it's the flow meter that's setting new standards for gas measurement. Ask your Foxboro Field Engineer for complete details. Or write for Bulletin 7-15. The Foxboro Company, 666 Neponset Ave., Foxboro, Massachusetts.

FOXBORO

REG. U. S. PAT. OFF.

Retarded Acid Gets Results in Problem Wells

This table shows some of the recent results of Retarded Acid treatments performed by Dowell on problem wells in many areas. We hope it gives you some ideas that will result in greater profits from your wells.

LOCATION	NAME OF FORMATION	AMOUNT OF RETARDED ACID	RESULTS
Albert, Canada	Slave Point Mid Devonian Vugular lime	4000 gallons (acid-oil-emulsion type)	Production from old well went from 0 to 218 bopd.
Franklin County, East Texas	Limestone	30,000 gallons	16-fold gas production increase—from 400 mcfd to 6400 mcfd.
San Juan County, Utah	Paradox (Desert Creek Zone)	75,000 gallons (acid-oil-emulsion type)	Production boost from old well was 34 to 450 bopd in field where regular acid treatments are usually unsuccessful.
Ellis County, Kansas	Kansas City Lansing	2000 gallons (acid-oil-emulsion type)	Production nearly three times that of offset wells. $881 treatment cost paid out in 19 days.
Andrews County, West Texas	Pennsylvanian	10,000 gallons (acid-oil-emulsion type)	Production from old well boosted from 10 bopd to 60 bopd stabilized. This 50 bopd increase was made in a field where offset wells treated with 10,000 gallons regular acid usually yield an uneconomical 5 bopd increase.
Logan County, West Virginia	Big lime	4000 gallons	Production increased 100-fold to one million cfpd. Treatment cost paid out in two weeks. Entire well cost paid out in less than five months.
Lea County, New Mexico	Wolfcamp lime	3000 gallons (regular type) 15,000 gallons (acid-oil-emulsion type)	Well tested 275 bopd flowing. Other wells in field, given regular acid treatments, do not usually respond properly.
San Juan County, Utah	Paradox	40,000 gallons	Decline rate was reduced by treatment. Production was increased from 200 bopd to 700 bopd. Six months later production was still 700 bopd.
Alberta, Canada	D2	5000 gallons	Production from eight-year-old well had declined to zero with fluid level only 65 feet. One month after treatment, production had leveled off at 100 bopd, flowing.
Russell County, Kansas	Kansas City limestone	3000 gallons	Production boosted from 3 bopd to nearly 2000 bopd on test after clean-up.
McKenzie County, North Dakota	Madison lime	7000 gallons (acid-oil-emulsion type)	Production from old well increased from 35 bopd to 133 bopd after treatment. $3101.00 treatment paid out in 23 days.
Harrison County, East Texas	Pettit Oolitic lime	7000 gallons	Treatment of six-foot pay resulted in 40 mmcfd well with 60 barrels petroleum liquids per million.
Wabash County, Illinois	O'Hara lime (Highly soluble)	3000 gallons (acid-oil-emulsion type)	Well production stabilized at 75 bopd and treatment cost paid out in ten days. Regular acid had given poor results on nearby wells.
Fremont County, Wyoming	Embar lime	5000 gallons (acid-oil-emulsion type)	21 boph test from a pay that had been acidized and abandoned several years before. This treatment saved a well that would have been plugged otherwise.

Almost without exception, these treatments employed other Dowell products and services in addition to Retarded Acid. Most of the more recent treatments listed here were designed by Dowell engineers with the aid of the Acid Guide* – a method developed by Dowell for use in engineering acid treatments to get optimum results.

Take full advantage of Dowell's long experience, proved additives, and engineering ability. Call Dowell to perform your next acidizing treatment. Dowell services and products are offered from more than 150 offices and stations in the United States, Canada, Venezuela, Argentina, Germany, France and the Sahara area. Dowell, Tulsa 1, Oklahoma.

SERVICES FOR THE OIL & GAS INDUSTRY

DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

*DOWELL SERVICE MARK

"Every dollar in our production budget is doing a man-size job . . . take these Unibolt Valves, for instance"

The UNIBOLT WING VALVE was designed originally as an "adjustable choke" for Christmas tree service. It is performing that job with distinction everywhere.

However, production men have found so many other uses for this wing valve that it is losing its original identity and is now regarded as an excellent multi-purpose valve!

Gas meter runs are one good example of this valve's versatility. It is equally popular on oil gathering manifolds, waterflood injection manifolds, heater-treaters, and a wide range of special valve applications. The one-inch opening in the UNIBOLT Valve will usually pass a far greater volume of gas than can be produced. Unlike conventional single purpose gate and plug valves, the UNIBOLT Valve offers a number of advantages: Conversion to positive choke or Pressurematic Valve, completely salvageable, easily renewable parts, and selective trims.

Make every dollar in your production equipment budget do a man-size job, too! UNIBOLT Valves, Fittings, and Couplings are made for you with that in mind.

UNIBOLT

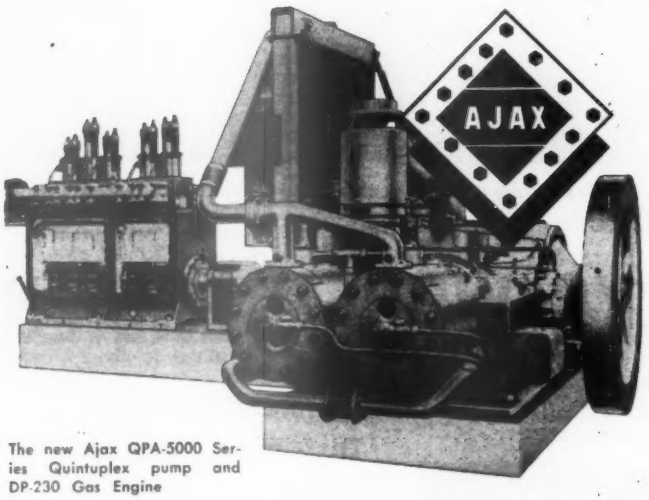
THORNHILL CRAVER CO.

P. O. Box 1184, Houston, Texas

AJAX Gives You DEPENDABLE OPERATING AUTOMATION

With BUILT IN POWER SUPPLY

- **Stark simplicity of operation and servicing — you don't need a specialist.**
- **Control engine speed to load and water requirements.**
- **Engineered to actual horsepower requirements without destructive overload capacity required by instantaneous starting demands**



The new Ajax QPA-5000 Series Quintuplex pump and DP-230 Gas Engine

The need for dependable electrical power still remains one of the weak links in the usual automation installation — especially in remote locations and under certain climate conditions.

Ajax time proved engineering has now solved many of the automation-electrification problems. Automation today is economically sound if the equipment and the installation are designed to meet your particular problems. Contact your Ajax distributor today for the full story on automation without external electrification.

Ajax gives you true economy because of simplicity of design, ease of maintenance, extra long life, and 83 years of quality craftsmanship experience.

AJAX ENGINES AND PUMPS

AJAX IRON WORKS CORRY, PENNSYLVANIA

Oil Field Distributors

- The National Supply Co. — Pittsburgh, Pennsylvania
- Bethlehem Steel Co. — Supply Division, Tulsa, Oklahoma
- Mid-Continent Supply Co. — Fort Worth, Texas

First joint of Pittsburgh Steel casing is ready to enter hole drilled near the 1907 scene pictured below.

THE ROUGHNECKS WORE DERBIES

Roughnecks casually pour nitro into well preparatory to shooting in the early Bradford field in Pennsylvania about 1907.

Pioneer Independent Distributor Now Sells Pittsburgh Steel Oil Country Goods From New York To Texas

Roughnecks wore derbies and horsepower had tails when one service-minded Pittsburgh Steel Co. independent distributor began operations in the pioneer Pennsylvania grade field.

Today, 54 years later, his flexibility, imagination and personal service still make the difference.

This typical "Mr. Independent" now provides oilmen in eight states with seamless tubular products

Roughneck cleans threads on Pittsburgh Steel seamless casing before running it into hole. Independent distributor who sold this casing has handled Pittsburgh Steel's tubular goods for nearly a quarter-century.

Inspecting joint ends are Peter E. Douylliez, Pittsburgh Steel Co. field engineer; Homer Ferringer, foreman for Manufacturers Light & Heat Co.; and Mark Wagner, salesman for distributor.

made by Pittsburgh Steel Co., a pioneer in its own right, whose experience with oil country goods goes back to almost the turn of the century.

• **From Soft Hats To Hard Hats**—As an early distributor whose history started in 1907, this Mr. Independent grew and flourished with the expanding industry and his stores followed the new fields across two-thirds of the continent.

Now he supplies oilmen in Texas, Oklahoma, Michigan, Pennsylvania, New York, Indiana, Kentucky and Illinois.

Three generations of the same family have run the business with the grandson of the founder now in the president's office.

With service and good products as a foundation, this distributor built up a wide range of shop facilities and repair equipment until now he is unique in the field. Nearly a quarter-century ago, he began supplying his customers with seamless tubular products made by Pittsburgh Steel Co., also a pioneer in its field. Let Mr. Independent tell you himself why these two veterans—an independent distributor and a mill that sells only through non-captive outlets—work together so well.

• **Lots Of Help**—"We get awfully rough competition from some of the big fellows. But we make out by being flexible, imaginative and by giving personal service.

"Pittsburgh Steel gives us a lot of help. The mill bends over backward to cut red tape and it moves fast when it's necessary to get some quick action."

You can't do better than making a connection with an independent Pittsburgh Steel distributor. His only obligation is to his customers.

For your next order of drill pipe, casing or oil well tubing, get in touch with one of the Pittsburgh Steel independent distributors listed below.

Distributor Home Offices

Atlas Bradford Company
Houston, Texas

Bennett Supply Company
Midland, Texas

Buckeye Supply Company
Zanesville, Ohio

C. W. Cotton Supply Company
Tulsa 5, Oklahoma

Franklin Supply Company
Denver 10, Colorado

Houston Oil Field Material Co.
Houston, Texas

Industrial Supply Company
Wichita Falls, Texas

Iverson Supply Company
Dallas 1, Texas

Longhorn Supply Co., Inc.
Houston 14, Texas

Lucey Export Corporation
New York 7, New York

Lucey Products Corporation
Tulsa 19, Oklahoma

McJunkin Corporation
Charleston 22, West Virginia

Midland Supply Company
Wichita 7, Kansas

Mountain Iron & Supply Co.
Wichita 2, Kansas

The Producers Supply & Tool Co.
Fort Worth 2, Texas

Sandy Supply Company
Wooster, Ohio

Southwest Supply Company
Pittsburgh, Pennsylvania

The Straker Supply Company
Jackson, Michigan

Superior Iron Works & Supply Co.
Shreveport, Louisiana

Tex-Tube, Inc.
Houston 7, Texas

Western Supply Company
Tulsa 1, Oklahoma

Pittsburgh Steel Company

Grant Building • Pittsburgh 30, Pa.

DISTRICT SALES OFFICES

Atlanta, Chicago, Cleveland, Dallas, Dayton, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, Tulsa, Warren, Ohio

Steel

TEXAS GIANT... *1000 BHP WHITE/SUPERIOR*

ENGINE-COMPRESSOR AT COASTAL STATES GAS PRODUCING COMPANY

This White W-64 four-cylinder compressor, driven by a Superior 8GX-825 supercharged gas engine, develops 1000 BHP at 900 RPM. One of the highest HP units of its type in operation today, it has a capacity in excess of 50 MMSCFD. This *matched design* engine-compressor set is on duty at Coastal States Gas Producing Company's station, south of Houston, near Manvel, Texas.

White's medium speed, heavy duty, balanced opposed compressors—200 to 1000 BHP—are specifically engineered for direct drive combination with Superior natural gas engines or electric motors. Two, four and six-cylinder models offer cylinder sizes from 4000 PSI, 2⅜" dia. to 85 PSI, 22½" dia., providing 68 different cylinders. Custom sizes and designs are also available.

Compact packaged units can be engineered to your most exacting requirements for gas lifting, boosting, repressuring, peak shaving or underground storage applications. Get new Bulletin 124. White Diesel Engine Division, Springfield, Ohio.

White DIESEL | Superior ENGINES

White Diesel

Improve your Engineering I.Q.*

* INCOME QUOTIENT

Buyer-Seller "Alliance" Important To Engineers; Orders Are Born of Confidence

It is oftentimes surprising to the engineer that in the course of his career, if it is to be a rewarding one, he will be required to develop talents of both selling and buying. To put it simply: *either you have sold or you have been sold every time you talk to someone.* If you haven't closed your mind, you will often be sold. If you are competent to do so, you will just as often sell someone else.

Selling and buying processing equipment is a highly developed field, but essentially it consists of buying and selling ideas. As you advance into supervisory, management and executive functions, you will be called on to exhibit greater buyer-seller abilities.

Most buying in industry involves from three to six individuals. Although the purchasing agent will be a key factor in all purchasing, almost all purchases in technical fields require the technical assistance of someone outside the purchasing department.

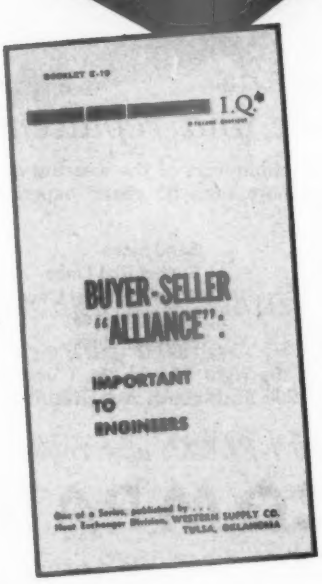
An industrial buyer, whether he is a purchasing agent or an engineer, is *human*, and is responsive to the same human values that you are when you buy a car or a suit of clothes. The industrial purchaser, though, is keenly aware of the plant and organization for which he buys. He is conversant with the product needed, and with its ultimate use.

The purchaser's objective is to procure the right equipment or material, of the right quality, in the right quantity, at the right time, from the right source, and at the right price. In accomplishing this he actually becomes a "salesman-selling-a-salesman."

In modern business the purchasing department should be a profit-making department. A four per cent savings in purchase costs, for instance, might be equal in profits to a 20 per cent increase in sales volume. Considering that the average industrial firm spends about 50 to 60 cents of each sales dollar for purchases, purchasing savings can easily represent the margin of profit.

In one large steel company, costs of products and services bought exceeds four million dollars for each working day. The variety of products bought is in the tens of thousands and these are purchased from nearly 50,000 suppliers.

WRITE FOR YOUR COPY TODAY



The foregoing paragraphs are taken from one of Western's "professional development" booklets, and reflect our own philosophy on the subject.

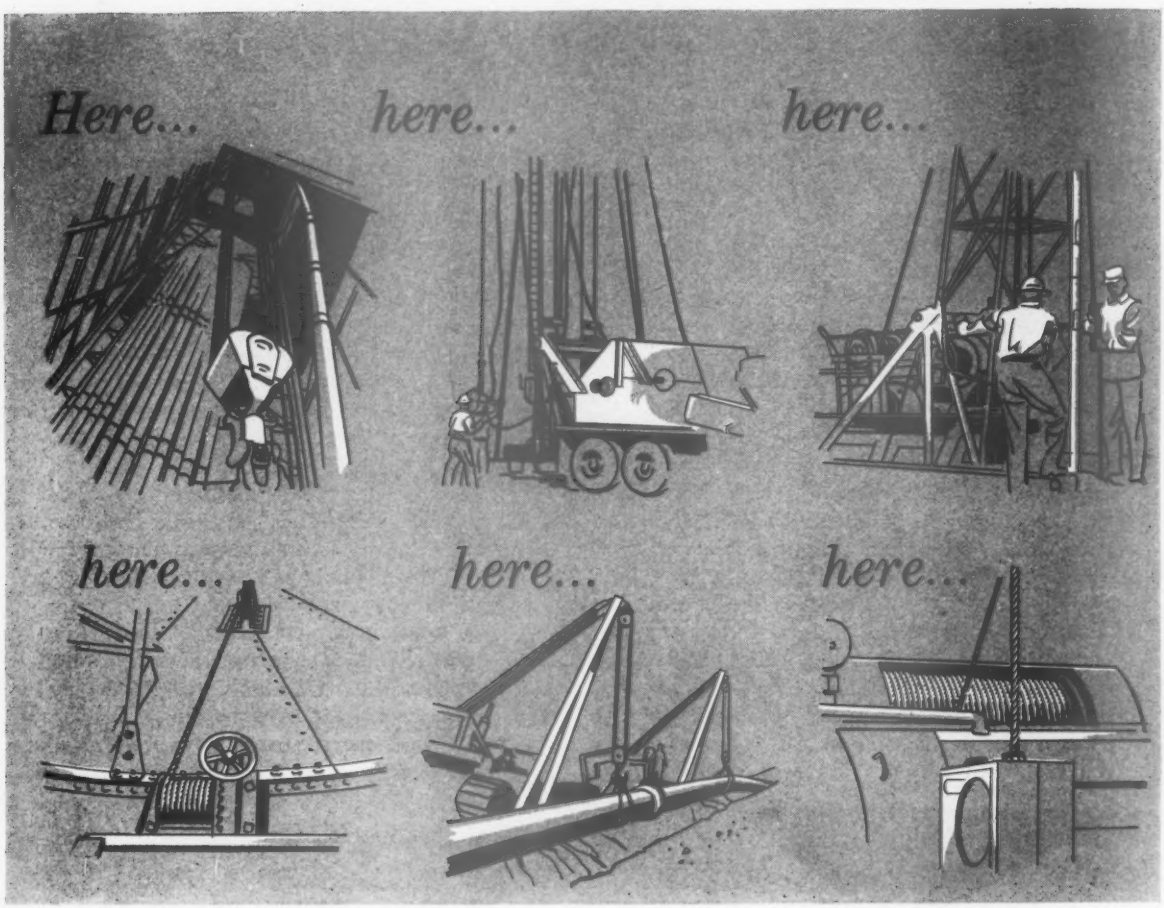
Understanding both sides of the coin — the problems of the buyer as well as the responsibilities of the seller —has long been required of all Western sales and engineering personnel. It has contributed greatly to the compatible relationships Western enjoys throughout the petroleum and chemical industries.

Your invitation to discuss heat exchanger problems with your purchasing and engineering departments would be welcome . . . as will your request for your copy of "Buyer-Seller 'Alliance' Important to Engineers."

WESTERN
HEAT EXCHANGERS
WESTERN SUPPLY COMPANY
P.O. Box 1888 – Tulsa, Oklahoma

The right Macwhyte

reduces wire-line wear



ROTARY TON-MILE CALCULATOR AVAILABLE FREE—Round trip ton-mile calculator with double slides is of special interest to contractors, drilling superintendents and engineers. Ask any Macwhyte office or distributor for Calculator No. 58101.

Less wire-line wear means less maintenance and replacement

In the right Macwhyte, you get the exact combination of the wearing qualities your equipment demands. Macwhyte has more than 60 years' experience in meeting the needs of the oil patch in...

Rotary Lines	Cable Tool Lines	Sand Lines
Pumping Lines	Core Barrel Lines	Sucker Rod Lines
Swabbing Lines	Torpedo Lines	Stainless Steel Lines
Monel Metal Lines	Winch Lines	Hoisting Lines
Casing Lines	Derrick Guy Lines	Spudder Lines

Ask a Macwhyte distributor to recommend the right Macwhyte. Circular 6156 free upon request to Macwhyte Company, 2900 Fourteenth Ave., Kenosha, Wis.

Ask about Macwhyte's new 7-FLEX® wire rope

MACWHYTE Wire Rope COMPANY

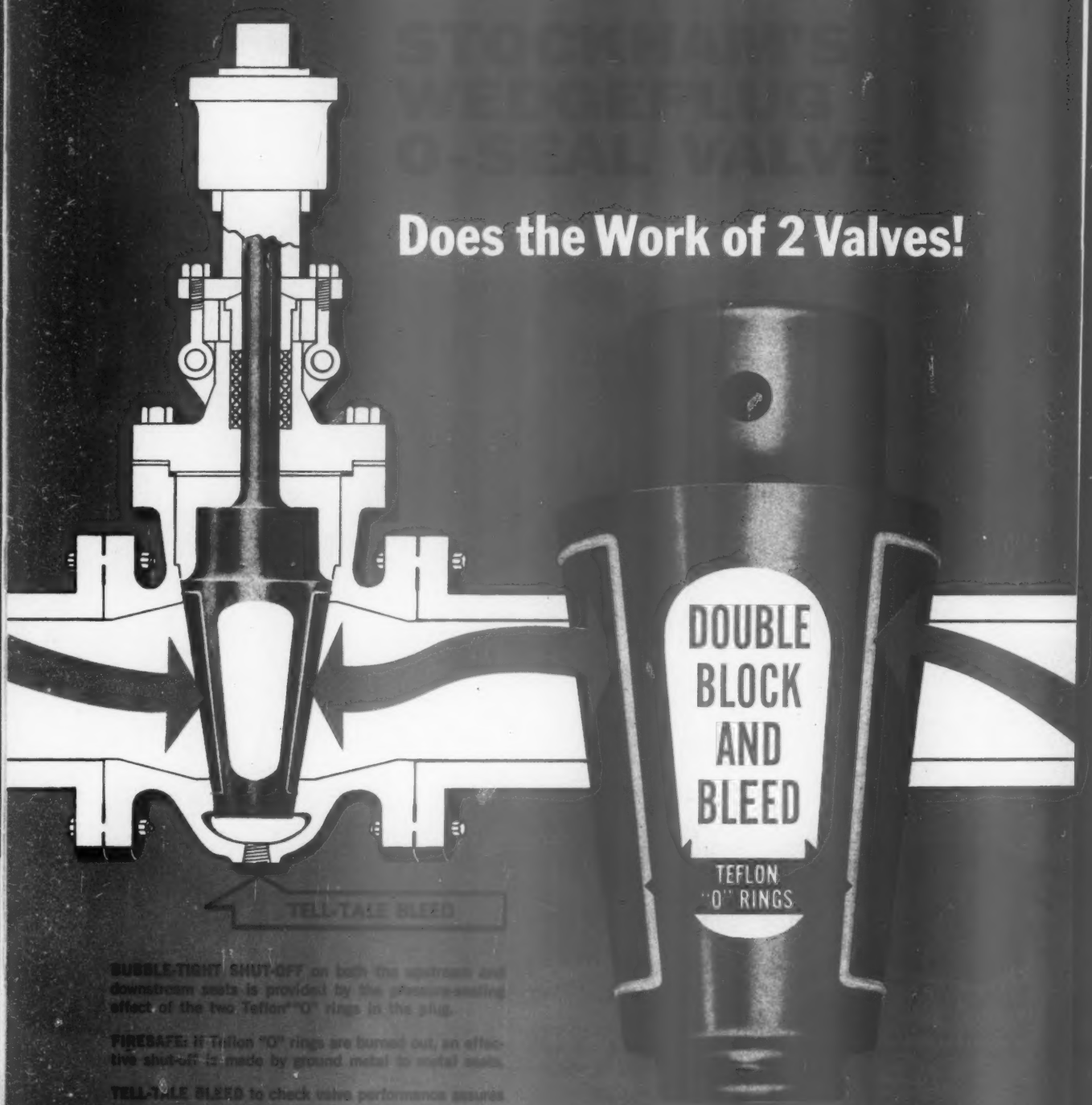
Wire Rope Manufacturing Specialists Since 1896

"Things are really looking up since we moved our account to Bank of the Southwest. They helped us increase our returns from our oil and gas properties."

"They're our bank, too. Their officers understand the problems of the oil man."

Bank of the Southwest
NATIONAL ASSOCIATION, HOUSTON
Member F. D. I. C.

Does the Work of 2 Valves!



BUBBLE-TIGHT SHUT-OFF on both the upstream and downstream seats is provided by the pressure-sealing effect of the two Teflon "O" rings in the plug.

FIRESAFE: If Teflon "O" rings are burned out, an effective shut-off is made by ground metal to metal seats.

TELL-TALE BLEED to check valve performance assures no product mixing in manifold.

NON-LUBRICATED — the O-Seat eliminates the high daily cost of lubrication, as well as the danger of product contamination caused by plug-seat lubricants.

GUARANTEED not to stick.

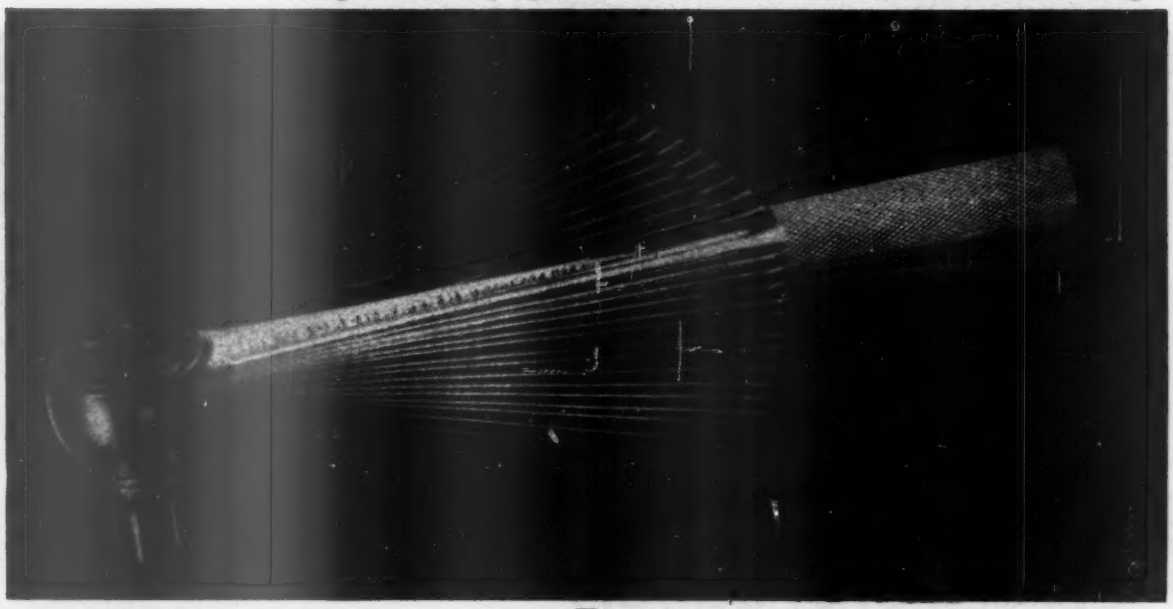
AVAILABLE THROUGH YOUR LOCAL STOCKHAM DISTRIBUTOR
Bronze, Cast Iron, Ductile Iron, Cast and Forged Steel Valves
Cast Iron, Malleable and Ductile Iron Pipe Fittings

WEDGEPLUG VALVE COMPANY DIVISION

STOCKHAM
VALVES *and* **FITTINGS**

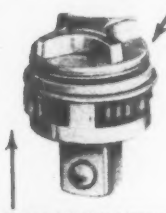
Get the swing with WILLIAMS ⅜" and ½" diameter *SUPERRATCHETS®*.

Complete nut rotation requires less than 4½° swing.
Long handle is proportioned for ideal balance, comfort and leverage.



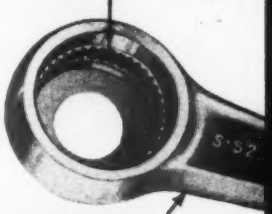
Get the features **Modern design and manufacture combine to produce a ratchet 50% stronger than U.S. Government requirements with these quality features:**

SINGLE UNIT CONSTRUCTION. EASILY REMOVED FOR CLEANING AND SERVICING.



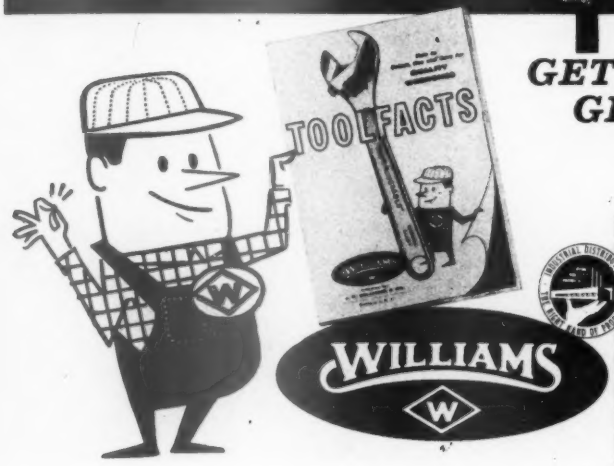
STRESSES EVENLY DISTRIBUTED THROUGHOUT ENTIRE MECHANISM.

41 TEETH GIVE 82-TOOTH ACTION



THE HARDER THE PULL ON THE HANDLE, THE MORE TEETH THAT COME IN CONTACT.

Get the flexibility **88 Drivers and attachments in ¼", ⅜", ½", ¾" and 1" drive sizes, plus 254 sockets, offer endless combinations to solve any nut-turning problem.**



GET THE FACTS... GET TOOLFACTS... MR. WRENCH

suggests that you send for this New 24-page booklet on How to Select, Use and Care for Quality Wrenches.

J. H. WILLIAMS & CO., 415 VULCAN ST., BUFFALO 7, N. Y.
Division of United-Greenfield Corporation

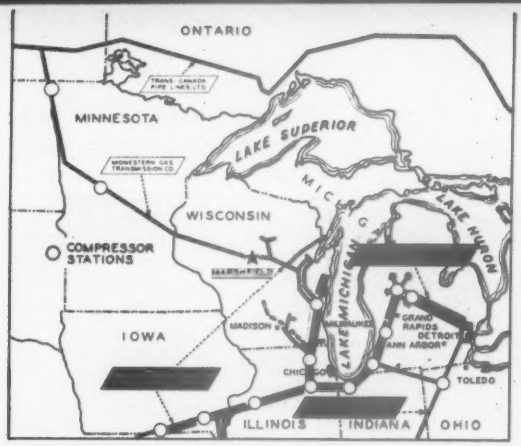
Mr. Wrench: Please send me your new
☐ TOOLFACTS Booklet ☐ ILLUSTRATED CATALOG No. 304

NAME_____ TITLE_____

FIRM_____

STREET_____

CITY_____ ZONE____ STATE____



Map shows location of Marshfield Station and how it connects with lines in that part of the country.

Now... gas from Canada joins U.S. supply

This compressor station at Marshfield, Wisconsin, recently made history. Here, for the first time, Canadian gas entered the midwest for the U. S. market to bolster supplies for Michigan-Wisconsin customers and to provide added security for these utilities.

This new transmission station of Michigan Wisconsin Pipe Line Company, equipped with three 2,000 hp Cooper-Bessemer GMWA-8 gas engine compressors, handles 158 MMCFD, boosting pressure from 500 to 975 psi. Also, Cooper-Bessemer En-Tronic Controls provide complete sequential starting, automatic control of gate valves and full protection. Contractor for the station was Stearns-Roger Manufacturing Company.

The Marshfield Station is one of many in the vast Michigan Wisconsin system which are equipped with Cooper-Bessemer gas engine compressors, some with records of more than 10 years of sustained operation.

When you plan compression facilities, it will pay to call in Cooper-Bessemer engineers for assistance.

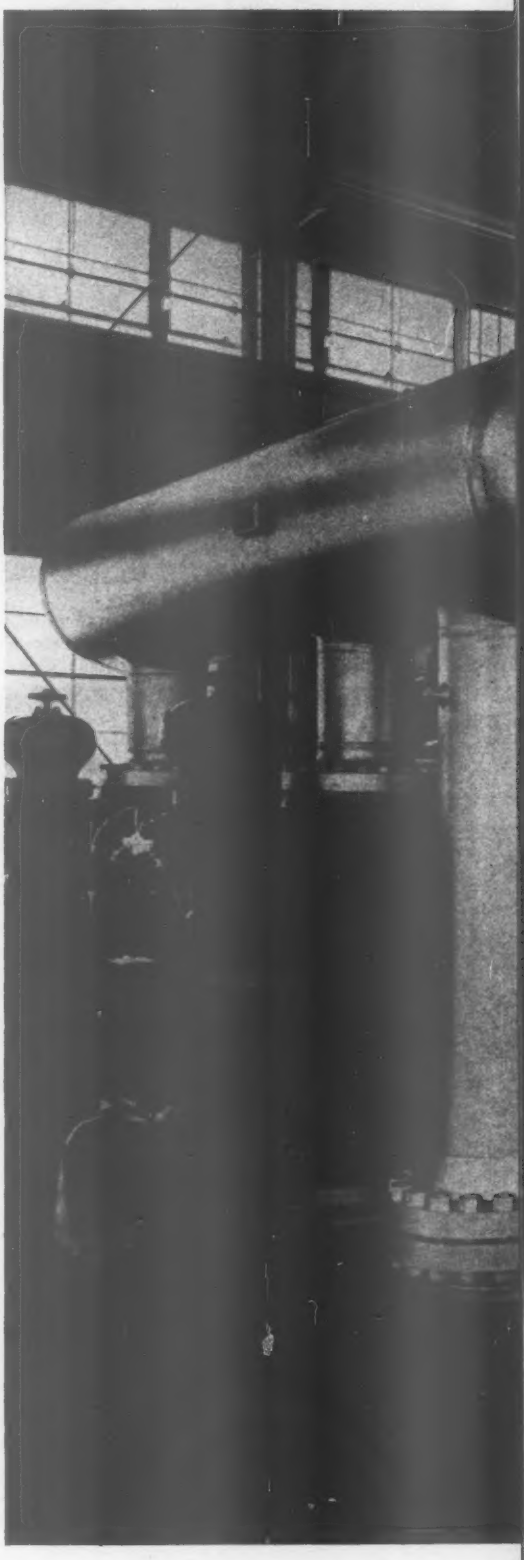
BRANCH OFFICES: Grove City • New York • Washington
Gloucester • Pittsburgh • Mount Vernon • Detroit • Chicago
Minneapolis • St. Louis • Kansas City • Tulsa • New Orleans
Shreveport • Houston • Greggton • Dallas • Odessa • Pampa • Casper
Seattle • San Francisco • Los Angeles

SUBSIDIARIES AND DIVISIONS: Cooper-Bessemer International . . . New York
Cooper-Bessemer, S. A. . . . Chur, Switzerland • The Hague, Netherlands • Mexico City • Buenos Aires, Argentina • Anaco, Venezuela
Caracas, Venezuela • San Juan, Puerto Rico
Cooper-Bessemer of Canada, Ltd. . . . Edmonton • Calgary • Toronto
Halifax • Stratford
The Rotor Tool Company . . . Cleveland
C-B Southern . . . Houston
The Kline Manufacturing Company . . . Galena

Cooper Bessemer

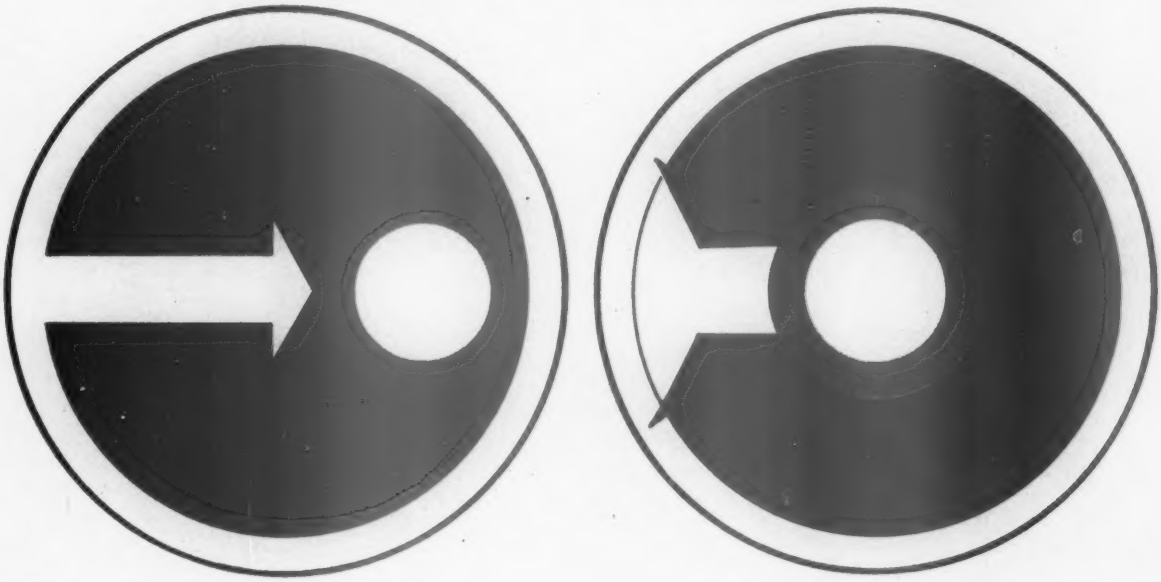
GENERAL OFFICES: MOUNT VERNON, OHIO

COMPRESSORS: RECIPROCATING AND CENTRIFUGAL
ENGINES: GAS - DIESEL - GAS-DIESEL
JET-POWERED GAS TURBINES



J. Ralph Orr (right), Superintendent, and Ted Ogan, Shift Engineer, Marshfield Station. In background: one of three Cooper-Bessemer GMWA-8 compressors and its En-Tronic control.

NEW PIPE-LAX IS THE WORLD'S BEST STUCK PIPE INSURANCE



When pipe is stuck . . .

Pipe-Lax gets it free.

IT SOAKS PIPE FREE

Now, from Magcobar research, comes the new way, the economical way of freeing stuck pipe. With new Pipe-Lax, an organic chemical concentrate, most losses of time, money, and patience because of stuck pipe and collars can be eliminated. In extensive field applications, Pipe-Lax has been used to free stuck pipe with better than 85 percent effectiveness! It is so inexpensive, it can be used whenever you have sticking problems.

For the best insurance available against the high cost of fishing for stuck pipe, keep a drum on your well. The sooner you use Pipe-Lax for freeing stuck pipe, the better your chances are of saving an expensive fishing job. Contact Magcobar today for complete details.

Magnet Cove Barium Corporation, Houston, Texas.

Magcobar Complete DRILLING MUD SERVICES

DRESSER INDUSTRIES, INC.
OIL • GAS
CHEMICAL
ELECTRONIC
INDUSTRIAL

Well Done with Magcobar Technology

New "Black Art" plant for DX Sunray

This ultra-modern, high efficiency, dewaxing and wax fractionation unit was designed and constructed by Foster Wheeler at DX Sunray Oil Company's Tulsa, Oklahoma, refinery. It produces approximately 5800 bbl day of lubricating oils and 137 tons/day of paraffin and microcrystalline waxes with an oil content of less than 0.2%. Ten different feeds are processed by blocked operation, ranging from 65 vis/100 F spindle distillate to Bright Stock and petrolatum.

The new unit's compactness, accessibility, versatility, and its instrumentation and control show direct application of Foster Wheeler's long engineering and process experience with the so-called "black art" of dewaxing and wax fractionation. The entire installation is tightly planned into a 230 ft by 308 ft area. Wax and oil are separated by selective solvency, using a blend of methyl-ethyl-ketone and toluol as the solvent. The solvent is also used in wax fractionation. Automatic flow controllers regulate solvent-to-feed ratios and other critical volumes.

The installation's gas turbine is the first used as a prime mover in the dewaxing process. An FW waste heat boiler utilizes turbine exhaust gases to produce all process steam. The propane and flue gas compressors operate on a single turbine shaft without gear reduction.

This plant is another example of Foster Wheeler's ability to serve you . . . to build your plant . . . any process . . . any size . . . anywhere. Foster Wheeler Corporation, 666 Fifth Avenue, New York 19, New York.

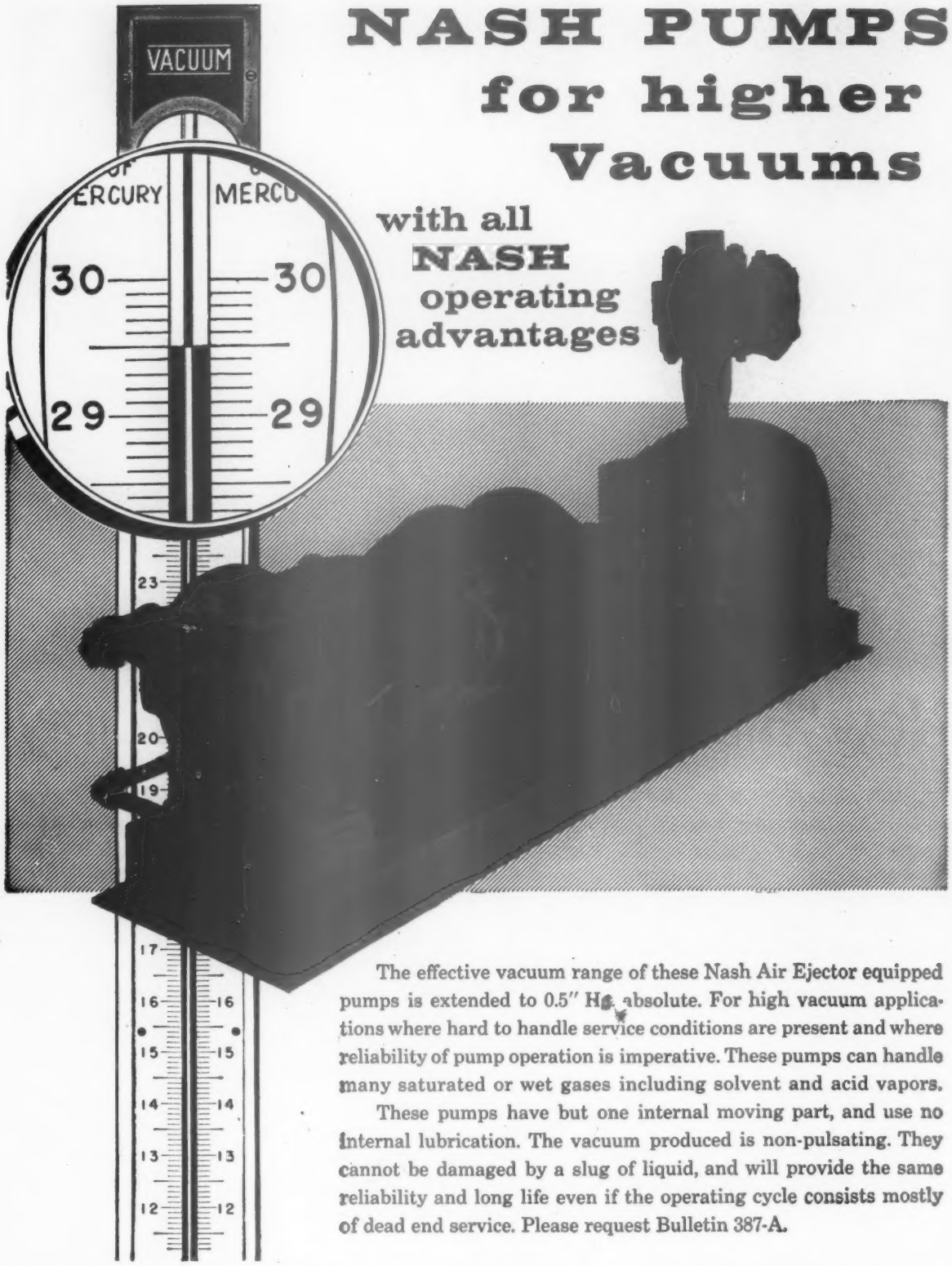
Heat Engineered products, plants and processes . . . for the world's industrial progress.

FOSTER WHEELER

NEW YORK TORONTO LONDON PARIS MILAN TOKYO

NASH PUMPS for higher Vacuums

with all **NASH** operating advantages



The effective vacuum range of these Nash Air Ejector equipped pumps is extended to 0.5" Hg. absolute. For high vacuum applications where hard to handle service conditions are present and where reliability of pump operation is imperative. These pumps can handle many saturated or wet gases including solvent and acid vapors.

These pumps have but one internal moving part, and use no internal lubrication. The vacuum produced is non-pulsating. They cannot be damaged by a slug of liquid, and will provide the same reliability and long life even if the operating cycle consists mostly of dead end service. Please request Bulletin 387-A.

NASH ENGINEERING COMPANY

SOUTH NORWALK, CONNECTICUT, U. S. A.

Which one contains Olin Ethanolamine *

*the one that's closest to you

(of course!)

Once you've established product quality, the ethanolamine that's closest to you is your best buy. A nearby source means dependability and convenience. That's why Olin distributors can so well serve gas dehydration and component recovery installations.

When you need a shipment of ethanolamines, call one of the locations listed below. They have ample stocks (mono-, di- and tri-) in bulk and drums, ready for immediate delivery to your operation. For the name of distributors in other areas, for product specifications or samples, phone or write—
OLIN MATHIESON, Organic Chemicals, 745 Fifth Ave., New York 22.

L. H. BUTCHER CO., 3628 E. Olympic Blvd., Los Angeles 23, Cal. ● WESTERN CHEMICAL & SUPPLY CO., 627 W. First St., Odessa, Tex. ● WESTERN CHEMICAL & SUPPLY CO., P. O. Box 2175, Farmington, N. Mex. ● WESTERN CHEMICAL & SUPPLY CO., 700 S. Locust St., Borger, Tex. ● CHEMICAL SERVICE, INC., P. O. Box 1282, Oil Center Station, Lafayette, La. ● RANGER CHEMICAL CO., 2000 Preston Ave., Houston 1, Tex. 8942

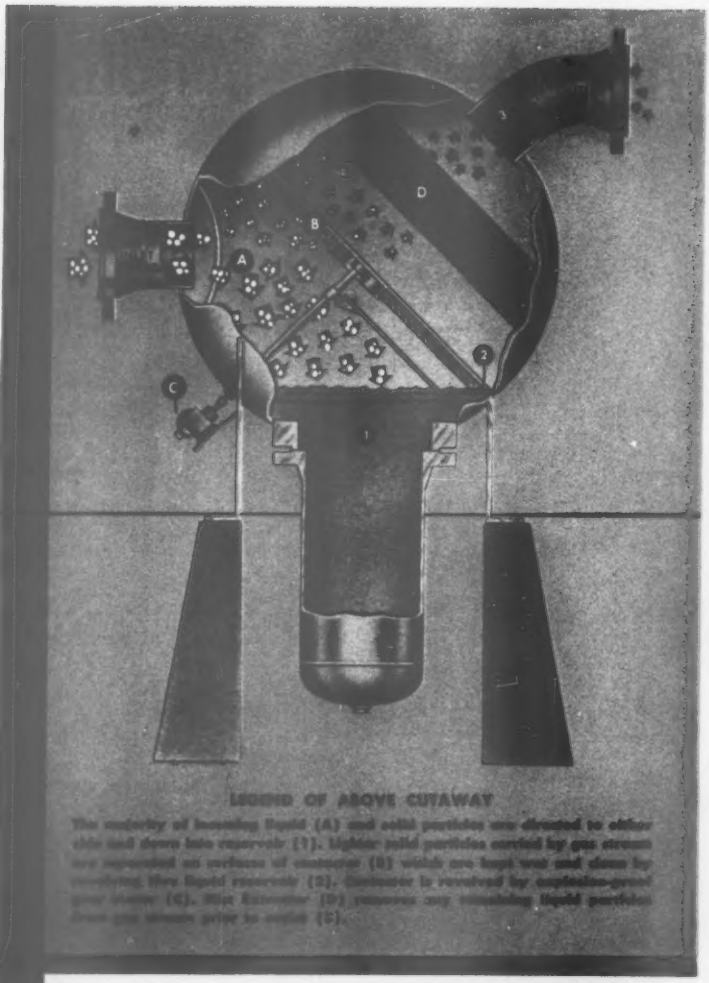
ORGANICS DIVISION Olin

Ethylene Oxide • Ethylene Glycols • Polyethylene Glycols • Propylene Oxide • Propylene Glycols • Polypropylene Glycols • Ethanolamines • Glycol Ethers • Surfactants • Ethylene Dichloride • Propylene Dichloride

MORE EFFICIENT RESULTS!

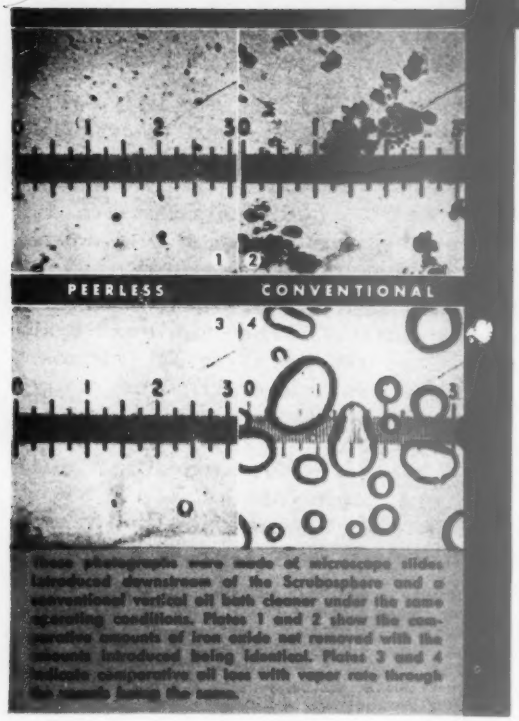
PEERLESS SCRUBOSPHERE*

*Spherical scrubber for dust and liquid removal from gas flow



LEGEND OF ABOVE CUTAWAY

The majority of incoming liquid (A) and solid particles are directed to either side and down into reservoir (1). Lighter solid particles carried by gas stream are separated on surfaces of contactor (B) which are kept wet and clean by circulating fiery liquid reservoir (2). Gas/vapor is revolved by combination-guard gas stream (C). Mist Eliminator (D) removes any remaining liquid particles from gas stream prior to outlet (E).



These photographs were made of microscope slides introduced downstream of the Scrubosphere and a conventional vertical oil bath cleaner under the same operating conditions. Plates 1 and 2 show the comparative amounts of iron oxide not removed with the amounts introduced being identical. Plates 3 and 4 indicate comparative oil loss with vapor rate through the vessels being the same.

LOOK AT THIS TEST The test at the left indicates the superiority of Peerless Scrubosphere over conventional oil bath dust scrubbers. The SCRUBOSPHERE operates with no loss of efficiency at low flows, minimum liquid loss, and very low pressure drop. Other outstanding features include easy vessel access with removable self cleaning contactor, a sump for slugs of solid or liquid particles, and minimum cost.

For detailed information write for Bulletin No. 181.

PEERLESS MANUFACTURING CO.

P.O. Box 13165 Dallas, Texas

Representatives in All Principal Cities

PEERLESS MFG. CO. DALLAS TEXAS

"OVER 20,000 SEPARATORS and SCRUBBERS IN SERVICE"

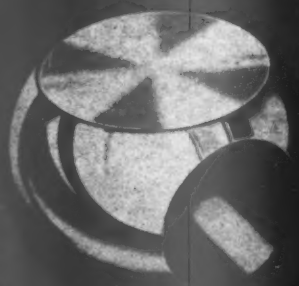
Now! The LUNKENHEIMER BALL VALVE

Fig. 700-T
¼" to 2", Screw Ends, Bronze Body, Teflon Seats and Seals.

Fig. 700-B
¼" to 2", Screw Ends, Bronze Body, Buna-N Seats and Seals.

AVAILABLE SOON in OTHER MATERIALS

New Top-Entry Design



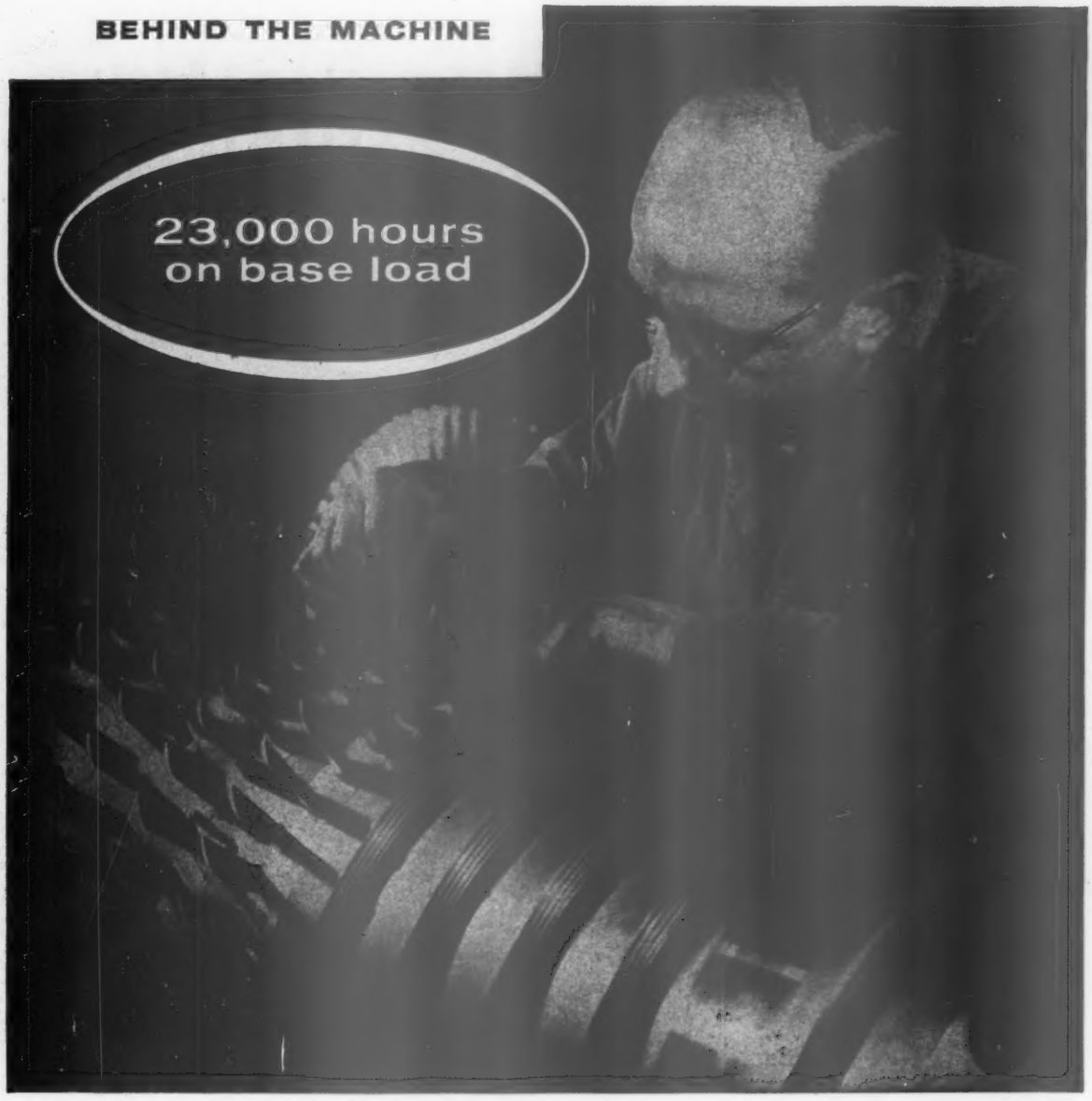
Engineered with traditional Lunkenheimer quality . . . self-aligning ball seals against both seats . . . long-lasting resilient seats for tight shut-off . . . straight-through flow . . . quarter-turn operation . . . top entry for easy maintenance

or write The Lunkenheimer Company, Cincinnati 14, Ohio

L-960-3

LUNKENHEIMER®
THE ONE *Great* NAME IN VALVES
• BRONZE • IRON • STEEL • PVC

BEHIND THE MACHINE



The proved reliability of AEI industrial gas turbines is typified by a machine in Venezuela which has recently completed 23,000 hours running on base load. AEI makes a range of industrial gas turbines with ratings from 1,750 kW upwards designed to run on gaseous or liquid fuels.

The picture shows work on the compressor rotor of L2IC gas turbines being built, at the AEI Turbine-Generator Division Factory for the Basrah Petroleum Co. These feature a single shaft design which ensures stable regulation and makes them particularly suitable for parallel operation with other generating equipment.

This is a product of AEI Turbine-Generator Division, Britain's largest manufacturer of Turbine-Generators.

AEI **Associated Electrical Industries Export Ltd**
33 GROSVENOR PLACE, LONDON SW1

Rugged joint of Extreme Line tubing permits repeated make-up and breaking out without galling. Operators like the fast make-up that results from the integral design.

Why operators prefer SPANG Extreme Line Tubing

Streamlined design of integral joint SPANG Extreme Line tubing eliminates the need for couplings. The high strength joint provides a metal-to-metal seal that resists leakage in the deepest, high pressure wells.

Extreme Line joints are streamlined internally and externally, minimizing possibility of hanging up or stripping under pressure. Integral joint eliminates 50% of the threaded connections in conventional designs.

Wide, heavy, modified Acme threads speed joint make-up with minimum chance of cross-threading.

SPANG Extreme Line tubing is readily available in grades J-55, N-80 and P-105. It rounds out National Supply's complete tubing line for every specific application. Call your National Supply representative for complete information, or write to National Supply Division, Armco Steel Corporation, Two Gateway Center, Pittsburgh 22, Pennsylvania.

See next pages for more information on Spang tubular products

Why SPANG Extreme Line Casing out-performs other casing in deep, high pressure wells

Unique metal-to-metal seal makes SPANG Extreme Line casing 100% leak resistant. Precision machined seals on box and pin ends of the casing bear up under the heaviest loads in tension and compression.

Integral joint eliminates couplings. The joint design provides greater strength with considerable reduction in diameter.

Cross threading is practically impossible. Any initial misalignment is automatically corrected by the broad, flat-crested threads which guide the pin quickly into positive engagement with the box.

Extreme Line casing can be re-run many times without galling. The sturdy, Acme-type threads afford higher recovery than API casing, without rethreading.

This advanced design reduces the number of threaded connections to one-half those required with T&C casing, as the coupling element is an integral part of the casing.

Extreme Line casing is available in Grades J-55, N-80 and P-110. Your National Supply representative will be happy to discuss the basic advantages of this casing with you. Or you can get complete details by writing to National Supply Division, Armco Steel Corporation, Two Gateway Center, Pittsburgh 22, Pennsylvania.

Extreme Line casing is just part of the National Supply complete line of oil country tubular products. Spang drill pipe and National drill collars were also used in this Louisiana well.

Why SPANG Drill Pipe and Tool Joints are the logical choice for your drilling program

SPANG drill pipe is specifically engineered to minimize leakage, fatigue, tension and corrosion. Operators have found they can depend on it for fast, dependable performance. There is also an advantage in the fact that National Supply is the only company that manufactures both drill pipe and tool joints.

Spangweld drill pipe and tool joints provide fast, dependable operation. The tool joints are welded to the drill pipe by an automatically controlled operation that insures accurate alignment and a high quality weld. Welding permits a streamlined contour and a reduced number of threaded elements. This tool joint connection also allows a small O.D. and maximum bore — a definite advantage for slim hole drilling.

Another field-proven SPANG drill pipe product is the Double Seal Shrink Thread tool joint. This joint is designed with two distinct seal areas — one internal and one external. The threads have no sealing function to perform. The two sealing surfaces and the shrink thread design result in a joint that is leakproof and minimizes possibility of washout. The tool joints can be removed and replaced easily in the field.

Both of these drill pipe products are available with SPANG Hardfacing, a superior protection for tool joints in abrasive formations. It consists of multiple bands of tungsten carbide, continuously over-lapped on the joint to form a solid particle-to-metal band.

SPANG drill pipe is readily available in every diameter and type now in use. Consult your National Supply representative for details, or write direct to National Supply Division, Armco Steel Corporation, Two Gateway Center, Pittsburgh 22, Pennsylvania.

Spang drill pipe is field-proven in the toughest oil country applications. It is available in a full range of sizes.

Steel

Steel's Symbol of strength, long life, and economy

This Spang CW pipe is used in gathering lines in this California operation. The pipe has wide application in gas, oil and water gathering lines.

MOST DEPENDABLE STANDARD PIPE IN THE WORLD... SPANG CW Pipe

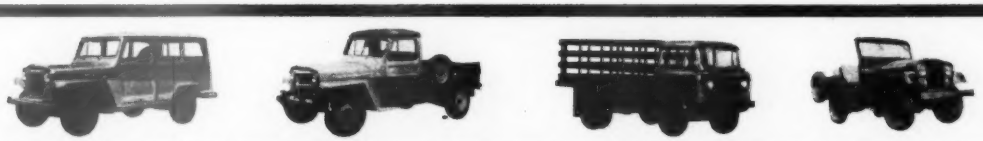
Superiority of SPANG CW steel pipe is due to the strictest possible quality control in every manufacturing step. This quality control pays off in uniformity and dependability.

Every length of SPANG pipe is hydrostatically tested and inspected for thread quality. The uniformity of this pipe can save you many hours in laying gathering and feeding lines. And most important, there is no premium price for SPANG quality. All sizes, plain end or threaded and coupled, are available now.

Next time you buy pipe, call your National Supply store. You'll find the pipe is easy to cut, bend, thread and weld. For name of your closest source of supply, just write to National Supply Division, Armco Steel Corporation, Two Gateway Center, Pittsburgh 22, Pennsylvania.

ARMCO National Supply Division

Thousands of leading American companies keep their investment at a minimum with a 'Jeep' fleet. Great versatility and low initial cost give you the most versatile vehicle you can possibly get for your money! Traditionally rugged 'Jeep' construction keeps maintenance costs low today for complete Jeep® VEHICLES and the resale value high. Get in touch with us information! **Write to: Robert J. Kreusser, Fleet Sales Manager, Willys Motors, Inc., Toledo 1, Ohio.**

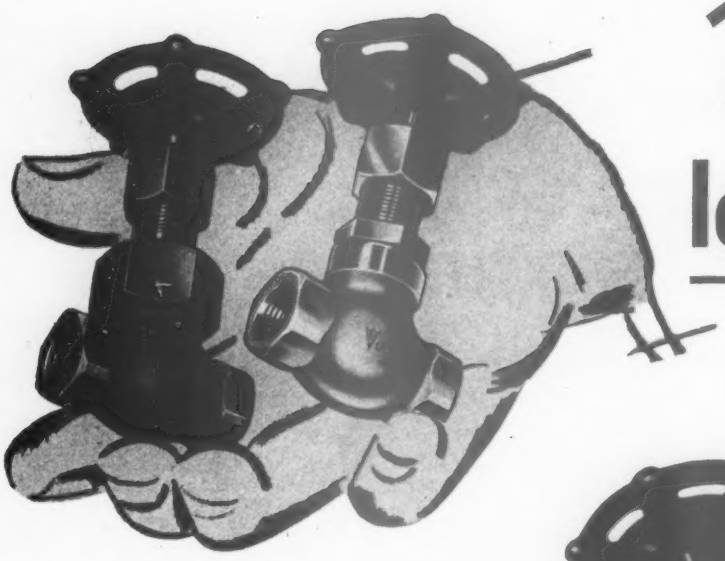


'JEEP' FLEETS—FROM THE WORLD'S LARGEST LINE OF 4-WHEEL DRIVE VEHICLES

Willys Motors, Inc., Toledo 1, Ohio. One of the growing Kaiser Industries.

New higher quality

New lower price



Enlarged production facilities combined with improved manufacturing techniques enable Vogt to pass on the effected savings to our customers.

Service proved — these valves have always been a standard of quality for meter and gauge line service. You no longer need to compromise for less because of price! Send for Folder GP-9 giving specifications and engineering data on both globe and angle types, forged from stainless or carbon steel for every meter and gauge line service.

Address Dept. 24A-FO

Vogt

HENRY VOGT MACHINE CO.
Louisville, Kentucky
SALES OFFICES: Camden, N. J., Charleston, W.Va., Chicago, Cleveland, Dallas, Los Angeles, New York, St. Louis.

GUIBERSON'S

OIL FIELD TOUGH PUMP PISTON

RUBBER LIP
. . flexible, tear resistant, provides maximum pump efficiency under high or low fluid pressures.

FORMULA-59 RUBBER COMPOUND
. . the secret of a longer pumping life. Developed in Guiberson laboratories, this unique rubber compound is a typical Guiberson solution of a tough oil field problem. Rugged, oil resistant, this rubber is exceptional in its resistance to tearing and for its long life in pumping abrasive drilling muds.

RETAINER PLATE
. . rounded edge, cannot cut rubber, often the cause of premature failures.

HUB
. . precision machined alloy steel forging, fits popular API tapers.

SNAP RING
. . quick and easy to install.

HEAVY FABRIC BACKING
. . greater support for high pressures and heavy muds . . firmly bonded to rubber.

pays off in around-the-clock reliable service

Whether using high pressures or low . . under abrasive or non-abrasive conditions, Guiberson pistons are *record breakers* for longer pumping between rubber changes. Compare them yourself in your own pumps. They are competitively priced, so you gain by longer runs.

Guiberson Pump Pistons
Are Sold by
Oil Field Supply Stores
Everywhere

GUIBERSON

ANNOUNCING: Two new package control units to simplify sequencing in compressor station operations

New UNION automation modules cut costs, provide first steps for complete pipeline automation

Since 1953 Union Switch & Signal has been providing the pipeline industry CENTRALIZED TRANSPORT CONTROL SYSTEMS that integrate all the elements of automation. The UNION systems are based on digital techniques that provide the ultimate in security and reliability . . . assure accuracy and substantially reduce operating costs.

Part of every UNION CTC SYSTEM is sequence control which we are now making available to the pipeline industry.

These modules make possible compressor station automation and, when installed, form the basis for future automation of pipeline operations.

UNION sequence equipment provides the user with: Accuracy • Security • Reliability • Low Maintenance Cost • Flexibility of Operations.

Angle engine compressor sequence control

UNION SWITCH & SIGNAL'S CTC SYSTEM for the remote, unattended operation of angle engine compressor stations is a package with all necessary intelligence for fail-safe operation.

By simply pressing a button on the sequence cabinet, the compressor will safely start, properly load and operate. Pressing another button will unload and stop the machinery. All of these operations are performed automatically and under the surveillance of monitoring devices.

UNION relays of the type used in this CTC system have been in service for more than ten consecutive years without requiring maintenance. An average of 4 million operations per relay per year is not an uncommon requirement in actual installations we have provided. Their operating characteristics do not change over a temperature range of −45°F to +160°F.

Unit loading valve sequence

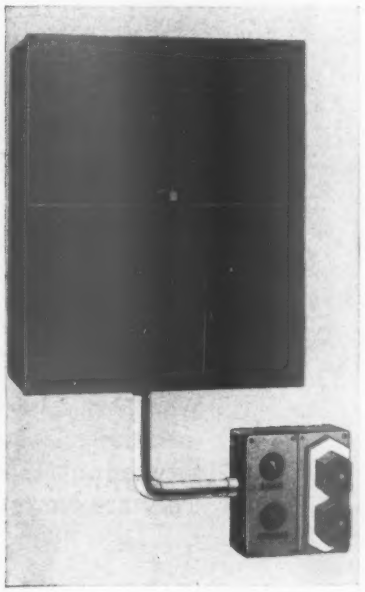
Where unit loading valve operations are performed manually at existing stations, or where compressor unit valves and main drive units are separated by fire walls which make manual operation impractical, Unit Loading Valve Sequence equipment provides the means for operating the suction, discharge, purge, vent and by-pass valves for proper loading and unloading of the unit under all conditions.

UNION Unit Loading Valve Sequence employs the same type of relay used in the Angle Engine Compressor Sequence Control. These extremely high-quality relays make it possible for us to provide the pipeline industry with the most reliable sequencing equipment presently available.

If you would like to have more information on these two new UNION control units, write for Bulletins 2008 and 2009, or call Union Switch & Signal, Pittsburgh 18, Pennsylvania, CHurchill 2-5000.

"Pioneers in Push-Button Science"

UNION SWITCH & SIGNAL
DIVISION OF WESTINGHOUSE AIR BRAKE COMPANY
PITTSBURGH 18, PENNSYLVANIA



Unit Loading Valve Sequence. The installation of Unit Loading Valve Sequence equipment is the first logical step toward the eventual complete automation of compressor stations.

Angle Engine Compressor Sequence Control. Adaptable for sequencing of 2- and 4-cycle engines, or turbines equipped with reciprocating or centrifugal pumps of compressors.

accuracy

ASHCROFT DURAGAUGES measure pressure with precise accuracy no matter how severe the conditions of service

Ashcroft Duragauges are available in pressure ranges from 15 psi (or vacuum) minimum to 100,000 psi. Dial sizes: 4½" through 12".

sustained

The Bourdon tube in Ashcroft Duragauges is manufactured to precision standards of flexibility and mono-linked to the rotary movement. When pressure flexes the tube, the gauge pointer is always positively positioned, because it is mounted on the geared center shaft of the movement. Sustained high accuracy and long life are assured.

Choose your Ashcroft Duragauges made of components best suited to your needs. Eight Bourdon tube materials are available. Movement of stainless steel with nylon bearings and pinion gear for longest wear. Case materials: special aluminum alloy or tough phenol plastic.

The unique "Maxisafe•" Duragauge provides absolute protection to the viewer, plus easy and quick access to the mechanism. Your industrial supply distributor will help you select the best combination of components for your Ashcroft Gauge requirements. Phone him today or write for Catalog 300B.

ASHCROFT PRESSURE GAUGES

A product of

MANNING, MAXWELL & MOORE, INC.

Gauge and Instrument Division • Stratford, Connecticut

Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario
Latin America: Export Division, Chrysler Building, New York, N. Y.
Europe: Manning, Maxwell & Moore, S. A., Fribourg, Switzerland

The reason to select O·C·T

SIMPLICITY WITH SAFETY ANYWHERE YOU DRILL

Different areas of the world offer different completion problems, but Oil Center Tool Company offers the most complete line of equipment for your well . . . whether it is shallow, deep, high pressure, low pressure, single, dual or multiple completion.

This means you can standardize on O-C-T . . . the **standard** throughout the oilfields of the world for dependability and simplicity with safety.

O-C-T equipment is available from the United States, France and England. Please write for new booklets now available on low pressure equipment and the standard lines of O-C-T medium and high pressure equipment.

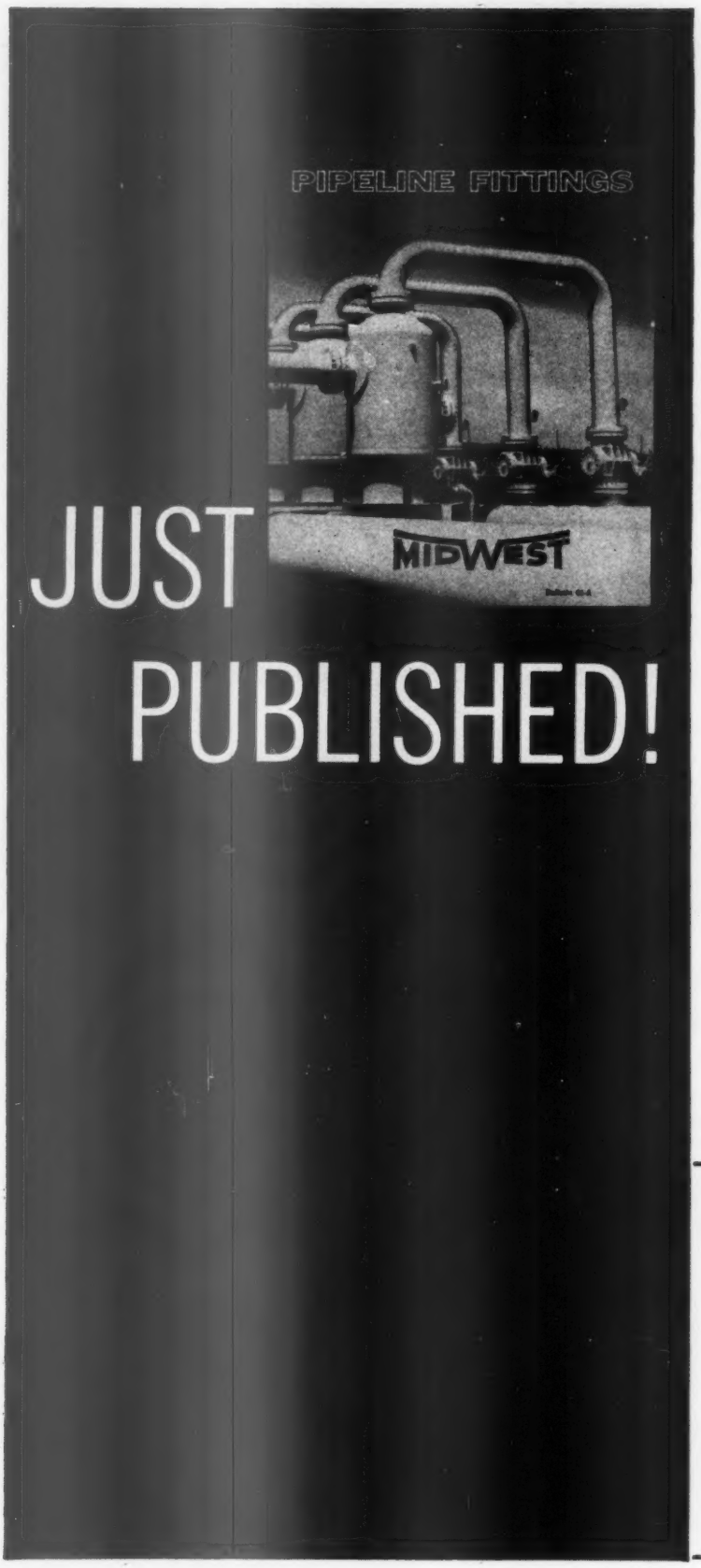
where progress is a daily practice

O·C·T

OIL CENTER TOOL CO.

SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION

Address Export Inquiries for All Countries to
, P. O. Box 3091, Houston, Texas.



- Provides a Wealth of Valuable Information on the Complete Line of Midwest Stock and Special Pipeline Fittings thru 42" Size:

  Ells, branches, flanges and specials.

  Extruded headers, venturi reducers, wrap around saddles, scraper bar tees, and other fittings designed for pipeline use.

  Fabricated compressor headers, pulsation dampeners, pipe bends and other tailored piping.

- Shows availability of each type of fitting in carbon steel, high yield strength and all other metals.

- Gives detailed working pressure ratings for each size and wall thickness, based on ASA Code B31.8 and B31.4.

- A Practical Handbook for All Who Specify, Design or Use Pipeline Systems.

For your free copy, send coupon now!

MIDWEST
PIPING
A Division of Crane Co.
1400 South Second St. • St. Louis 4, Missouri

Please send me a copy of your new Bulletin 61A on Pipeline Fittings.

NAME_____

TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE____

An outstanding line of LOUIS ALLIS adjustable-speed drives from ½ to 2500 hp.

Louis Allis offers you a complete line of adjustable-speed drives with various characteristics for every application where adjustable speed is required.

Experienced Louis Allis field engineers, supported by regional and factory industry specialists, will help you select the best drive or drive system to meet *your* requirements.

The Louis Allis line of drives provides outstanding control features ranging from simple manual to precise electronic or transistorized control. Selection of control varies, of course, with the nature of the installation and the precision required. Where desirable, speed regulation as close as .1% is obtainable.

Controls can be provided which automatically respond to temperature, pressure, or flow. Other control features include threading, inching, jogging, logarithmic acceleration, torque-limit acceleration, tachometer feedback... and many other control provisions that can exactly tailor a Louis Allis drive to *your* operation.

For process plants or applications involving inter-related motors and multiple drives, Louis Allis engineers can provide complete "systems engineering," furnishing all electrical rotating components and control.

For expert assistance, call your local Louis Allis District Office listed in the Yellow Pages under "Electric Motors"... or write direct to The Louis Allis Company, 449 East Stewart Street, Milwaukee 1, Wisconsin. Ask for Bulletin 2900, "Louis Allis Adjustable Speed Drives."

*TM-EATON MFG. CO.

LOUIS ALLIS

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

ASD-230

Francis DeRouen (left), Koppers Serviceman, and A. L. Eubanks, Inspector for Ford, Bacon & Davis, Monroe, Louisiana, watch "jeep" test on finished coating job.

Bitumastic® Enamels and Koppers service helped us lick our tough protection problems

"A thorough background of experience is extremely important on pipeline jobs, and Koppers Serviceman DeRouen has plenty of it," says Mr. A. L. Eubanks, Spread Inspector for Ford, Bacon & Davis, the engineering firm that designed and supervised the installation of Old Ocean Fuel Company's 24-inch gas line to Ft. Worth and Graham.

"Francis DeRouen's 26 years of experience with protective coatings helped us solve some knotty application problems on this job," Mr. Eubanks continued. "He helped us get the maximum corrosion protection with Bitumastic enamels on the really tough parts of the line, where heavy, wet gumbo places severe stresses on the pipe. We appreciated his services and our coating foreman profited from his advice."

The line was cleaned first with a Bitumastic Primer Solution. This was followed with a hot-applied coating of Bitumastic No. 70-B Enamel, at a temperature of 400 degrees F. Next a glass reinforced wrap was applied as an extra protective precaution. Finally a loose wrap of kraft covered with a tar-saturated No. 15 felt was placed around the pipe as a loose sleeve to protect the coated pipe from soil stress.

A Koppers Serviceman can help you solve your corrosion protection problems with Bitumastic coatings. For more information on Koppers servicemen and the Bitumastic coating line, mail the coupon or write: Koppers Company, Inc., Tar Products Division, Pittsburgh 19, Pa. District Offices: Chicago, Los Angeles, Pittsburgh, New York, Woodward, Ala., and Houston, Texas (Mavor-Kelly Co.). In Canada: Koppers Products, Ltd., Toronto, Ontario.

KOPPERS
BITUMASTIC
COATINGS AND ENAMELS
another fine product of COAL TAR

Koppers Company, Inc., Tar Products Division,
Dept. 104F, Pittsburgh 19, Pa.

Gentlemen:

I would like a copy of your booklet on pipeline coatings, "How Long Should A Pipeline Last?"

Name_____ Title_____

Firm_____

Address_____

City_____ Zone____ State_____

This NORTHWEST...

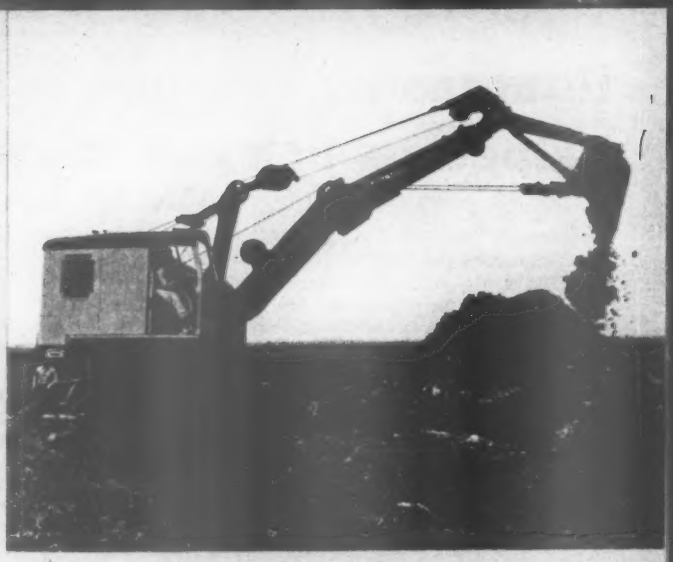
Goes ANYWHERE on The Pipeline!

It's the Northwest Hy-Trak! A Crawler built for pipeline work. Here you have a combination of open construction, ground gripping grousers and high clearance (26 inches) that lets you straddle obstructions and meet cross-country problems on the long mileage of pipeline work.

Here, two Northwests with Hy-Traks are doing a job on the 56 mile, dual 6 inch line from Seadrift to Bay City, Texas, for Sharman, Allen, Gay & Taylor, Inc., of Houston, Texas. Northwests have what you need for certain types of pipeline work. The ability of Northwests for output has been proved by such well-known pipeliners as R. H. Fulton Co., Brown and Root, H. C. Price, and many others.

Northwests bring you two-speed travel. You can have Hy-Traks or standard crawlers. The Northwest Feather-Touch Clutch Control brings ease of operation and makes the power of the engine available for throwing the main drum clutches. It brings the true feel of the load and is free of the complications and the maintenance costs of pumps, compressors and other delicate mechanisms. Uniform Pressure Swing Clutches give smooth, easy, day-in and day-out operation. Torque Converters are available.

—And Northwest Cranes bring you a long list of advantages that save time and money in either straight ditch work or in solving the many problems at highway and river crossings. Before your next pipeline job, check into the many advantages in Northwests. You lose nothing by asking for details.



UNPOSED PHOTOGRAPHS OF NORTHWEST DOING A JOB.

NORTHWEST ENGINEERING COMPANY
1513 Field Building, 135 South La Salle Street, Chicago 3, Illinois

NORTHWEST
CRANES • SHOVELS • DRAGLINES
PULLSHOVELS • TRUCK CRANES

C-41-27-CL

ERING

NEWS YOU CAN USE ABOUT ENGINE AND COMPRESSOR PERFORMANCE

Why these packing rings are hermetically sealed

No doubt about it, these Cook packing rings have received very special treatment.

Immediately after manufacture, they were carefully inspected, oiled, then hermetically sealed in a plastic bag to protect against dirt, moisture, and damaging corrosive atmospheres. You can be sure that the quality and precision of these Cook rings will not deteriorate before they're put into service.

This "red carpet" handling of a very important item is but another example of Cook's attention to detail — resulting in continued superiority of the finished product.

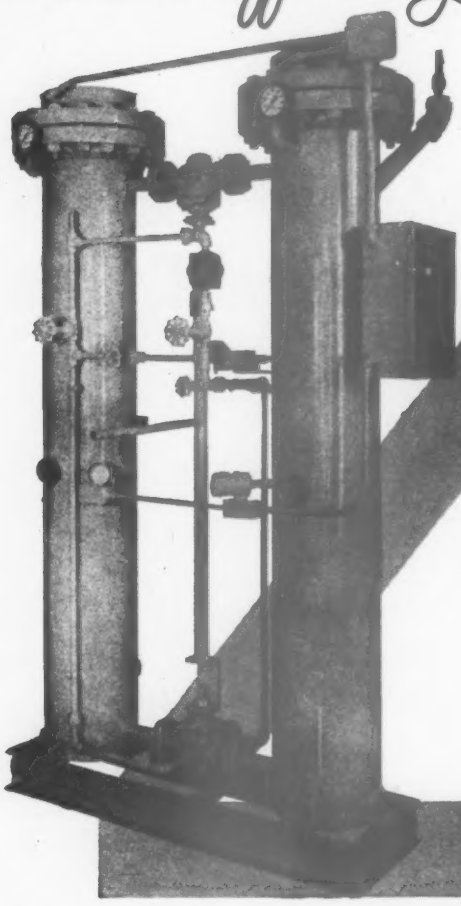
Cook packing rings are precision made to always give you a perfect seal — no matter how difficult the special sealing requirements of your application. Ask a C. Lee Cook representative for complete information. Or, write C. Lee Cook Division, Dover Corporation, 934 South 8th Street, Louisville, Kentucky.

C. LEE COOK

DOVER

KEMP ORIAD DESICCANT DRYERS

cut costs, add efficiency 4 ways!



1 Complete reactivation

An exclusive 3-zone embedded heater design gives every Kemp Oriad Desiccant Dryer extra drying power *economically* (effective distribution of heating elements assures high heat transfer efficiency). The most complete reactivation results... providing maximum desiccant capacity, minimum dewpoint performance.

2 Full automatic operation

Set the program timer and everything is regulated automatically. Gases are dried with the least pressure loss, lowest maintenance and operating costs. Your choice of manual or semi-automatic systems, too.

3 Accurate temperature control

Thermostatic control conserves heat input... maintains ideal temperatures for highest operating efficiency in drying instrument air, process air and gases to the lowest dew point, eliminating condensation or freeze-up, and other applications.

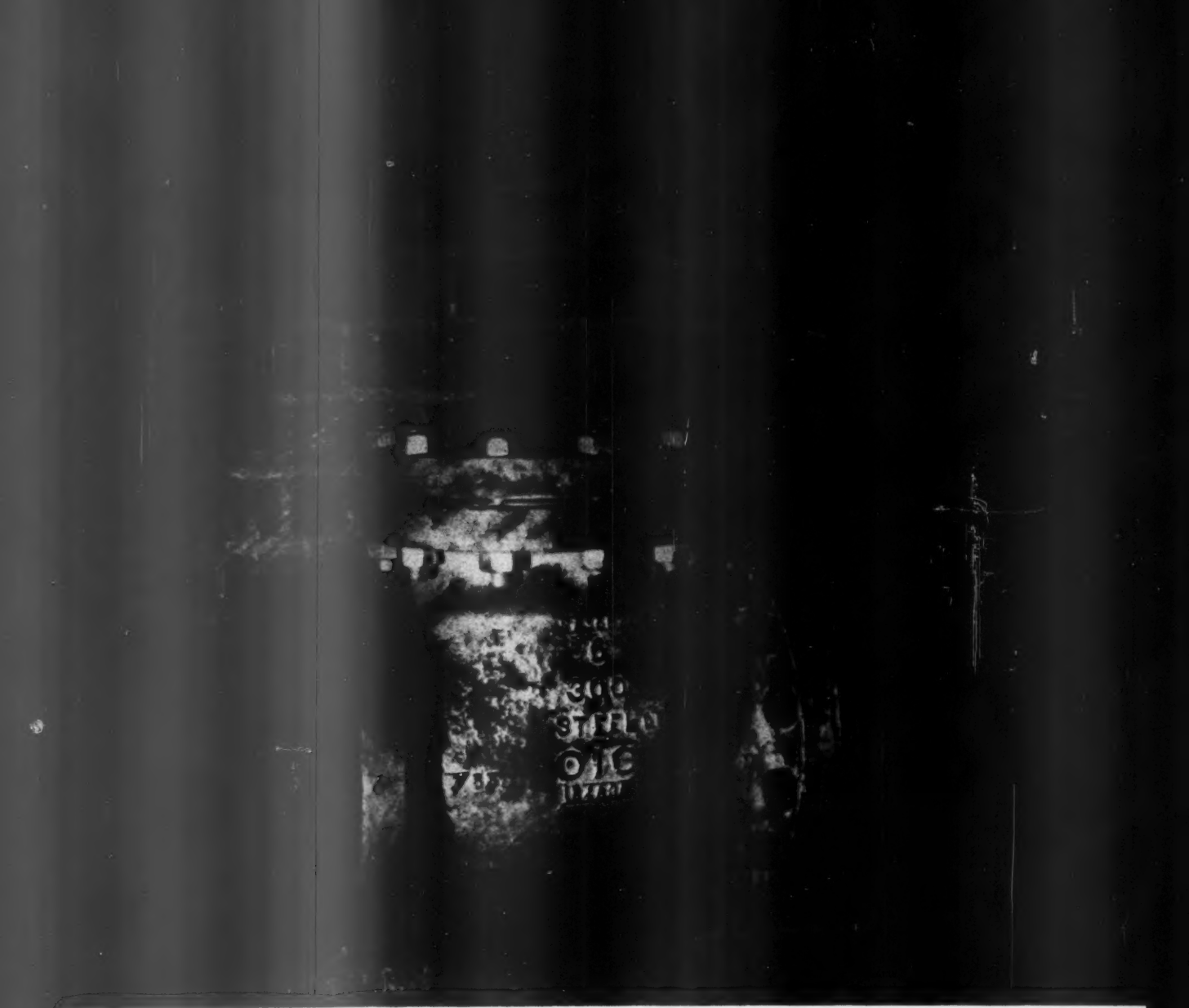
4 No moving parts

There are no blowers, fans or motors to create maintenance problems, rising operating costs. Unit comes fully assembled, ready to go. Liquid dryers also available. Write today for Bulletin D-103, or contact your Kemp man, listed in the Chemical Engineering Catalog.

It always pays to come to

KEMP OF BALTIMORE

THE C. M. KEMP MANUFACTURING COMPANY
405 E. Oliver St., Baltimore 2, Md.



PORTRAIT OF DEPENDABILITY

Undisturbed cobwebs tell a powerful story! Day in and day out, OIC steel valves take strain, vibration, pressure changes and shock in their stride. From the outside you get no hint of the precise manufacturing tolerances that make this trouble-free performance possible. OIC steel valves are designed to handle your steam, chemicals or hydrocarbons with minimum maintenance and maximum cost savings. Of this you can be sure . . . OIC steel valves are built to operate with complete dependability.

THE FINEST VALVES AND DISTRIBUTOR SERVICE FROM OIC

OIC VALVES

BRONZE, IRON,
FORGED STEEL,
CAST STEEL AND
DUCTILE IRON VALVES

INDUSTRIAL DISTRIBUTORS · THE RIGHT HAND OF PRODUCTION ·

THE OHIO INJECTOR COMPANY, WADSWORTH, OHIO

The Ohio Injector Company 1818-OIC
273 Main Street, Wadsworth, Ohio.

Your story interests me. Please send more information about valves used in my industry.

Name _____
Company _____
Product _____
Street _____
City _____ Zone ___ State _____

Memo to Management:

TO PUMP
OR NOT TO PUMP *EFFICIENTLY*
IS THE QUESTION
and PEPA has the answer

The question of dependable, efficient power for oil field pumping has been answered time and again with economical utility electric power. In most instances there is no substitute for the savings in maintenance, money and manpower provided through the use of purchased electric power. And this record of efficiency is not restricted to any one section of the petroleum industry. From the oil fields to the refinery it will pay you to investigate possible savings you may derive. Contact your Utility Electric Power Company for details.

A list of P.E.P.A. members will be furnished on request

PETROLEUM POWER ELECTRIC ASSOCIATION

BOX 35006, DALLAS 35, TEXAS

Hundreds of miles of pipelines gathering this "harvest" of oil and gas in the Northern Great Plains are built with Stupp Corporation *high-yield strength, lightwall steel line pipe.* And now even more pipeliners are specifying Stupp Corporation *custom-manufactured* pipe—they know it means faster, easier and safer handling, improved bendability and weldability, and *major all-around economies* at highest industry standards. Sizes range from 6⅝ through 16 inches. New longer lengths (up to 64 feet) mean *up to 34 fewer field welds per mile.* Call, write or wire Stupp Corporation for a quotation on *your* next job . . . wherever it is.

STUPP CORPORATION

MANUFACTURER OF CUSTOM STEEL LINE PIPE
FOR THE OIL AND GAS INDUSTRY

P. O. BOX 2348 • BATON ROUGE, LOUISIANA

SALES OFFICES: BATON ROUGE, LOUISIANA • HOUSTON, TEXAS • TULSA, OKLAHOMA
DENVER, COLORADO • JACKSONVILLE, FLORIDA • ST. LOUIS, MISSOURI

DRILL

AND MOVE

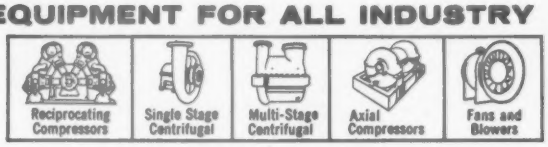
AND DRILL AGAIN

JOY AIR DRILLING COMPRESSORS ARE COMPLETELY SELF CONTAINED

Joy packaged compressors are ready to run when they arrive at the job. The compressor, power unit, heat exchangers, piping and controls are mounted on a single skid. They can be operated on the ground without any foundation, or left on the trailer for frequent short moves.

Power units may be diesel or natural gas. Compressors are available with multiple V-belt drive from the drilling rig, like the unit shown here. There are many types and sizes of Joy packaged compressors for air drilling with capacities up to 300 psi; 400 hp. For complete information on the proper model for your operations, write for bulletin 2823-31.

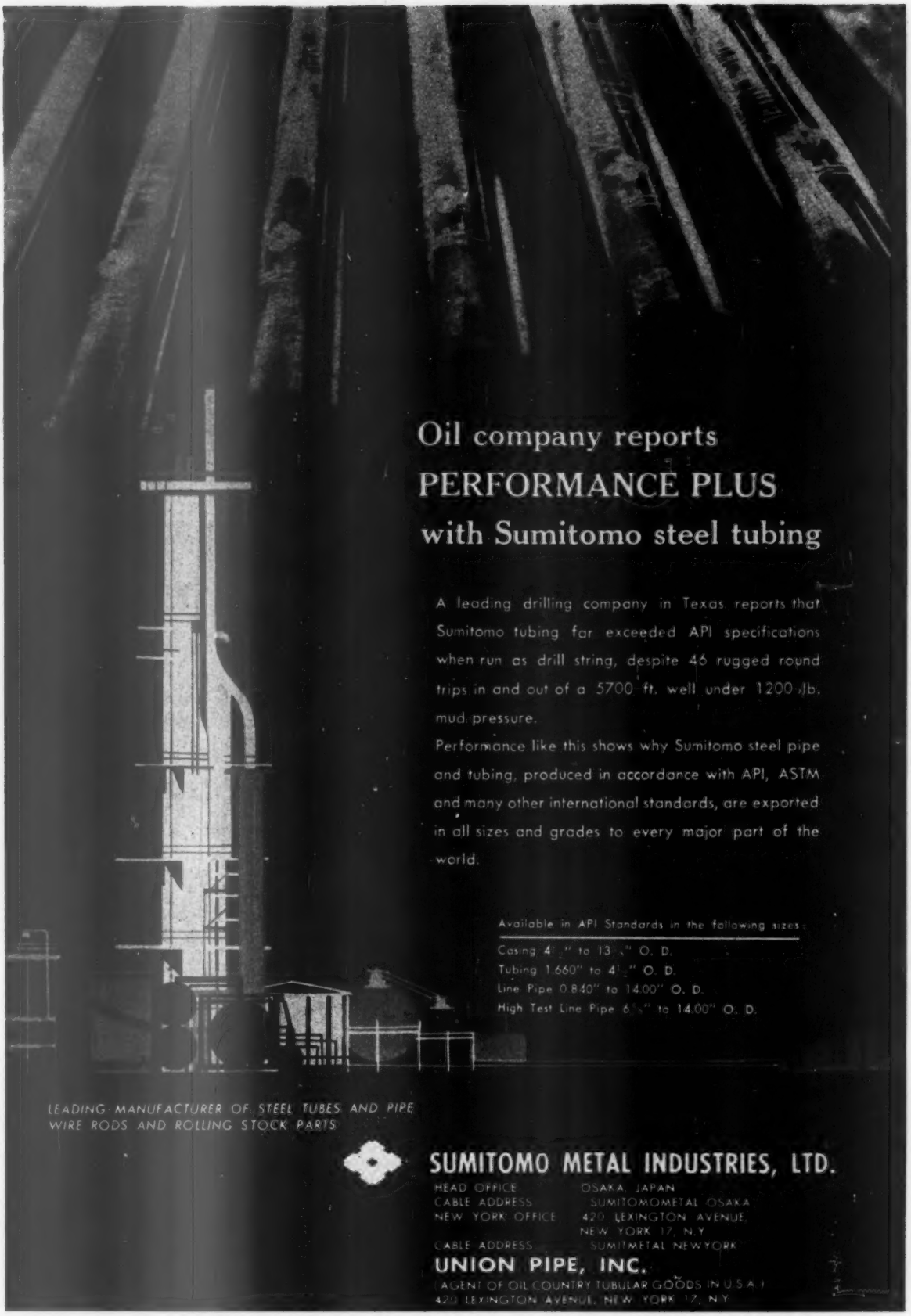
AIR MOVING EQUIPMENT FOR ALL INDUSTRY



JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario



Oil company reports PERFORMANCE PLUS with Sumitomo steel tubing

A leading drilling company in Texas reports that Sumitomo tubing far exceeded API specifications when run as drill string, despite 46 rugged round trips in and out of a 5700 ft. well under 1200 lb. mud pressure.

Performance like this shows why Sumitomo steel pipe and tubing, produced in accordance with API, ASTM and many other international standards, are exported in all sizes and grades to every major part of the world.

Available in API Standards in the following sizes:

Casing 4½" to 13⅜" O. D.
Tubing 1.660" to 4½" O. D.
Line Pipe 0.840" to 14.00" O. D.
High Test Line Pipe 6⅝" to 14.00" O. D.

LEADING MANUFACTURER OF STEEL TUBES AND PIPE WIRE RODS AND ROLLING STOCK PARTS

SUMITOMO METAL INDUSTRIES, LTD.

HEAD OFFICE OSAKA, JAPAN
CABLE ADDRESS SUMITOMOMETAL OSAKA
NEW YORK OFFICE 420 LEXINGTON AVENUE, NEW YORK 17, N.Y.
CABLE ADDRESS SUMITMETAL NEWYORK

UNION PIPE, INC.

AGENT OF OIL COUNTRY TUBULAR GOODS IN U.S.A.
420 LEXINGTON AVENUE, NEW YORK 17, N.Y.

another

TRETOLITE SERVICE report

FLUDEX*

Water Flood Additive stops filter channeling

BACKWASH ALSO ELIMINATES IRON SULFIDE, OIL DEPOSITS

Find out how FLUDEX can fit into *your* operation. Ask the Man in the Red Car. Or write to . . .

Inspection of the filtering elements in a mid-continent water-flood operation revealed that these elements were rapidly losing their efficiency due to oil clogging, iron sulfide deposits, and channeling in the graded anthracite media.

Filters backwashed with FLUDEX *Additive*

To correct these difficulties, the filters were backwashed, using FLUDEX Water Flood Additive in the following procedure:

Allowing water to stand on media to depth of 6-8 inches, 10 gallons of FLUDEX Water Flood Additive were introduced into filter. This was allowed to soak for about 20 hours. When the normal backwashing operation was begun, the effluent showed substantial quantities of oily material and iron sulfide. Backwashing was continued until effluent ran clear.

FLUDEX *now regular part of maintenance program.*

The inspection plate was then removed and visual inspection made. There were no holes or channels in filter media; it was also free of oil and iron sulfide. Results were so satisfactory that all filters in this water flood operation now undergo regular FLUDEX treatment as a routine maintenance measure.

*FLUDEX *is a registered trade-mark of Petrolite Corporation.*

TWF-60-4R

PETROLITE CORPORATION

SUBSIDIARY AND AFFILIATED COMPANIES

CANADA, Edmonton, Alberta • ENGLAND, London
GERMANY, Frankfurt, a. M. • VENEZUELA, Caracas

REPRESENTATIVES

ARGENTINA, Buenos Aires • BRAZIL, Rio de Janeiro • COLOMBIA, Bogota
ITALY, Rome • JAPAN, Tokyo • KUWAIT, Kuwait • MEXICO, Mexico, D. F.
NETHERLANDS, The Hague • PERU, Talara • TRINIDAD, Port of Spain

TRETOLITE COMPANY
DIVISIONS
369 Marshall Avenue, Saint Louis 19, Missouri
200 South Puente Street, Brea, California

Trans-Canada Pipe Lines Limited Chooses Worthington SUTC's . . .

FOR FIRST FULL AUTOMATION

At central control, the dispatcher pushes a button. At the compressor station miles away, a solenoid throws an air valve. Engine and compressor cylinders begin purging . . .

At 6 seconds, ignition actuates, fuel is admitted and the engine slowly accelerates toward 160 rpm. At 20 seconds the compressor cylinders stop purging. In 5 minutes, the engine-compressor is ready to be brought on line.

This is a glimpse of normal operation of Trans-Canada Pipe Lines Limited's Maple Station—the first to be fully automated by this pipeline company. Three Worthington SUTC engine-compressors operate in pre-set sequences according to signals from the dispatcher who, though 25 miles away, could be a thousand.

These new SUTC's have a higher compression ratio for increased efficiency; improved handling of heat load through new computer-designed Turbo-Chargers; and new bearing construction. Cylinder parts and Double Deck valves were manufactured in Canada.

The station organization chart shows the benefit of these automated SUTC's. This station has no operators. This saves initial cost of four houses and salary and overhead for the operators.

For complete information on SUTC's for automated or conventional installations, call your nearest Worthington District Office. Or write Worthington Corporation, Dept. 43-22, Buffalo, New York. In Canada, Worthington (Canada) Ltd., Brantford, Ontario.

WORTHINGTON

PRODUCTS THAT WORK FOR YOUR PROFIT

THREE | GREAT | SERIES

A MARSH Valve for every purpose

Yes, three great series of needle throttling valves. Great in design and construction. Great in range of corrosion resistant service. Great in range of sizes and patterns.

All three series share the basic design and construction that has set new standards for Marsh Needle Valves.

All give smooth, close regulation and positive shut-off from a few pounds pressure up to high pressures.

All have body and stem guides machined from solid bar stock to provide extra strength and valve life.

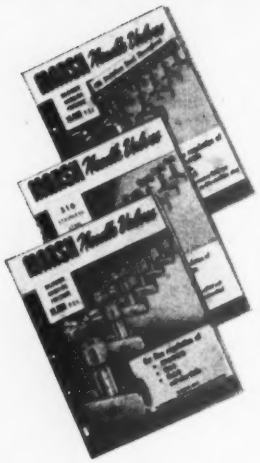
All have precision ground stems and long fine-pitched accurately-machined stem threads for micrometer regulation and tight shut-off.

All have deep inlet and outlet threads for tight make-up.

All have special, long-lasting, readily-replaced, special "Marpak" packing incorporating all-but-indestructible Teflon in the stainless steel series.

You see a globe valve representing each series here. Note that the color of the handle identifies the series. Valves come to you individually sealed in strong, transparent plastic packages. In appearance, in operation, in service life you have in these valves the kind of product that only Marsh experience in *both* valve making *and* instrument making could produce.

Globe and angle valves in all three series are available with double female connections in sizes ⅛", ¼", ⅜", ½", ¾" and 1"—with male inlet and female outlet in sizes ¼" and ½". Panel mounted types in all sizes. Write for bulletins.



Ask for bulletins

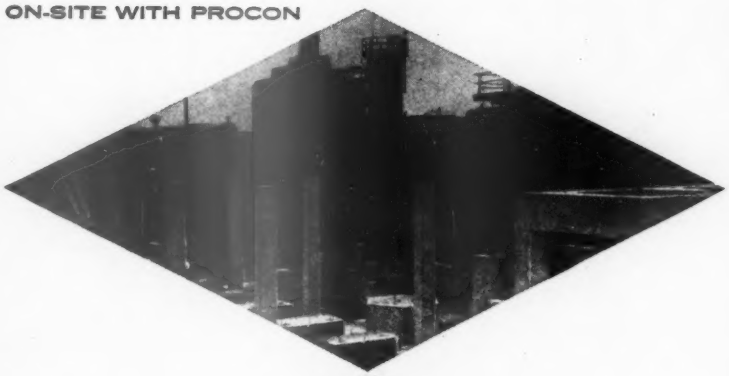
These three bulletins, covering alloy steel, 416 stainless steel, and 316 stainless steel valves will be sent to you in a binder. Write.

MARSH INSTRUMENT COMPANY, Dept. L
Skokie, Ill. *Division of Colorado Oil & Gas Corporation*
Marsh Instrument & Valve Co., (Canada) Ltd.,
8407 103rd St., Edmonton, Alberta, Canada
Houston Branch Plant, 1121 Rothwell St.,
Sect. 15, Houston, Texas
Eastern Seaboard Warehouse: Marsh Instrument Co.,
1209 Anderson Ave., Fort Lee, N.J.

In stock at your nearest Supply House

MARSH *Needle Valves*

ON-SITE WITH PROCON

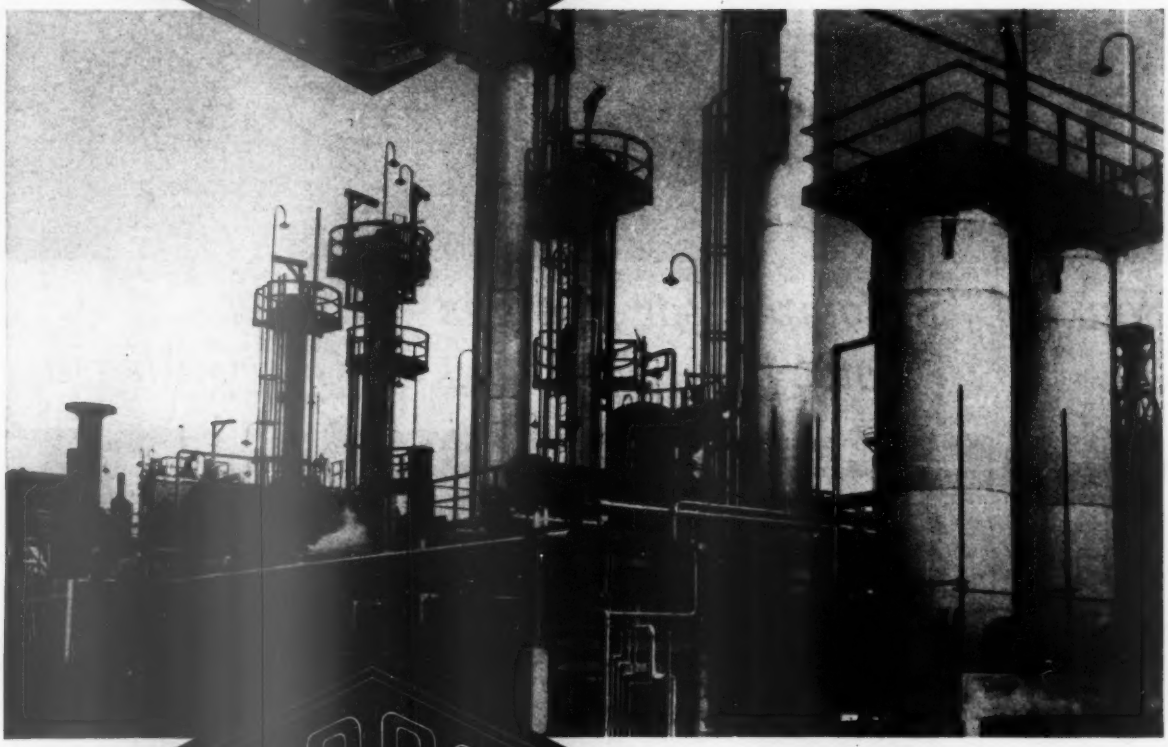


Procon-built Hydeal unit on-stream in 95 days!

Building a complicated process unit from the ground up requires the skillful coordination of a multitude of design, engineering, procurement and construction details.

It takes plenty of work, but most of all it takes time. Procon needed just 95 days from groundbreaking to on-stream acceptance of this Hydeal™ unit built for Signal Oil & Gas Company, in Houston, Texas. This highly efficient Hydeal unit produces 1,000 barrels-per-day of high quality benzene from a toluene charge. Signal markets the benzene direct to users in the Southwest.

New plant construction, expansion or modernization, whatever the requirement, you can trust the entire job . . . safely to PROCON.



PROCON *Incorporated*

1111 MT. PROSPECT ROAD,
DES PLAINES, ILLINOIS, U. S. A.

PROCON INTERNATIONAL S. A., CHICAGO, ILL., U. S. A.
PROCON (CANADA) LIMITED, TORONTO, CANADA
PROCON (GREAT BRITAIN) LIMITED, LONDON, ENGLAND
PROCON PTY. LIMITED, SYDNEY, AUSTRALIA
PROCOFRANCE S. a. R. L., PARIS, FRANCE
PROCON LIMITADA, SAO PAULO, BRAZIL
PACIFIC PROCON LIMITED, MANILA, P. I.
VICAPROCON, S. A., CARACAS, VENEZUELA

How C-B/S Compressor Designs Solve Your Problems in Gas Gathering

Whether your problem revolves around fine compressor balance for barge-mounted operations, remote control or split gas streams, C-B/Southern people understand your needs. Their application experience is coupled with actual oil and gas producing background. That is why they can provide you with on-the-spot suggestions to economically solve your toughest gas gathering problem. This background is enhanced by company knowledge gained in building more than 40,000 compressor horsepower last year.

C-B/Southern's experience extends through Design, Engineering and Manufacturing Departments. It reaches all the way to future service from 22 Cooper-Bessemer service offices.

A point worth remembering: C-B/S packaged compressor plants are available in horsepower ratings from 100 to 1440; unitized compressors, both reciprocating and centrifugal, to 10,500 horsepower.

CB

CB/S

C-B/Southern, P. O. Box 19267, Houston 24, Texas • HOmestead 8-5441

A division of The Cooper-Bessemer Corporation

MANUFACTURERS OF PACKAGED COMPRESSOR PLANTS FOR GAS GATHERING, GAS LIFT, GAS INJECTION APPLICATIONS

Here's Why Oil Men Specify
EC&M HIGH VOLTAGE STARTERS

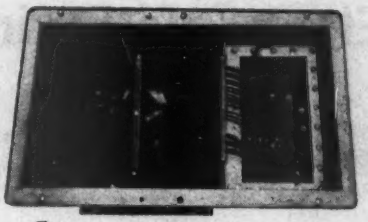
EC&M Type ZHS Starters at Southwestern pipe line trunk station

Designed for Easier Installation, Inspection and Maintenance

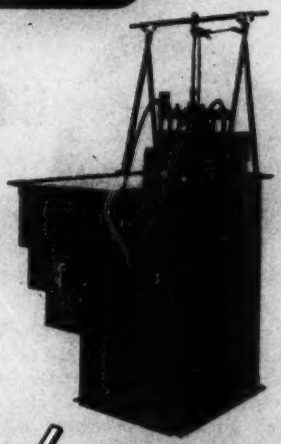
Specifically designed for Class I, Group D, Division 2, semi-hazardous locations . . . NEMA 3R (raintight enclosure). 50,000 KVA interrupting capacity.

***Fast* installation** because starters are shipped with all internal wiring complete. All leads are of anti-syphon construction.

Easy inspection • Contactor and overload relay panel may be raised, as one unit, above oil level. No disconnecting of bolts or leads. *(See lifting mechanism at extreme right.)* Safer, too . . . note view windows on each side of load-break disconnect switch.



View from above shows complete internal wiring . . . anti-syphon leads. These "ready-to-use" starters are complete with control transformer for 220 volt push button operation.



EC&M Contactor lifter raises contactor and overload relay above oil level for easy inspection. No bolts or leads to disconnect.

For literature describing EC&M's complete starter line, write for Bulletin 8131-T

SQUARE D COMPANY

EC&M DIVISION • CLEVELAND 28 OHIO

wherever electricity is distributed and controlled

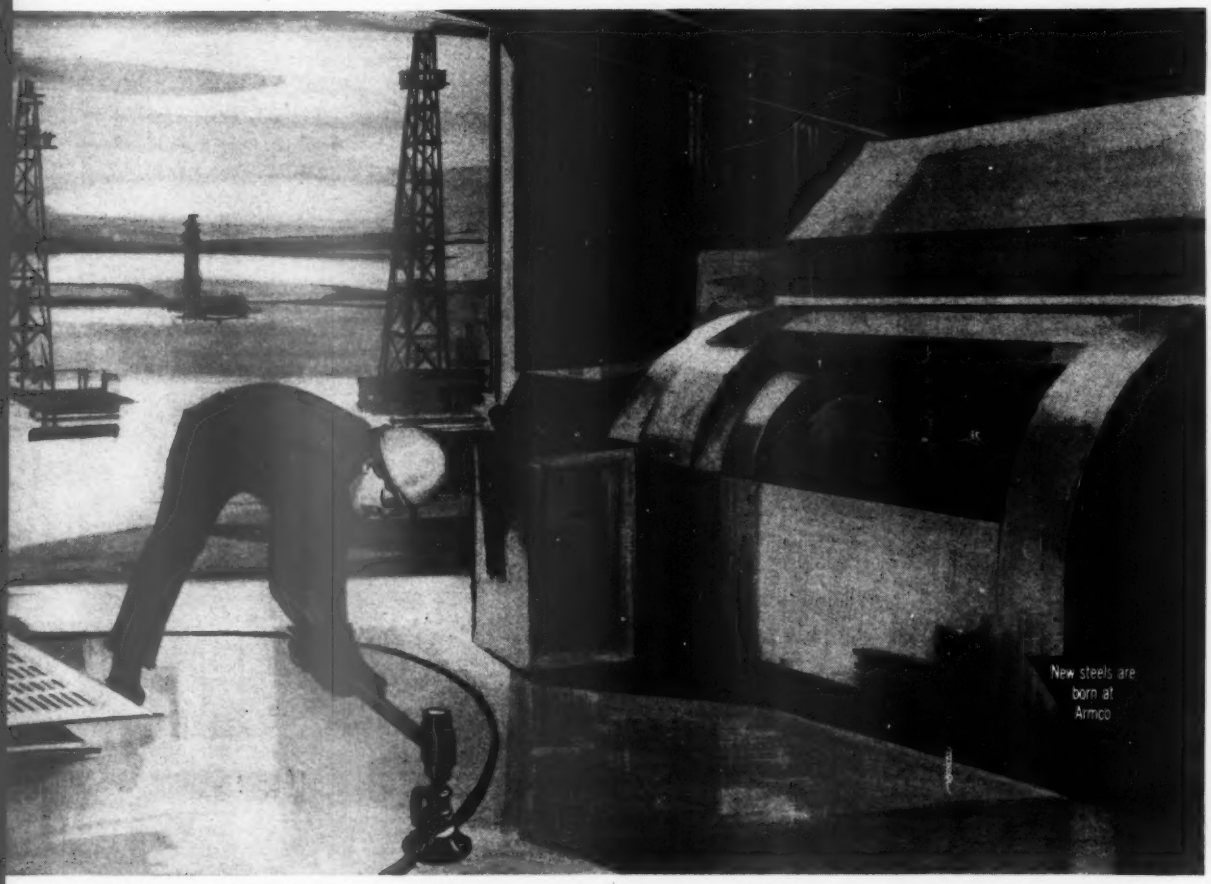
8020

Electronic Brain Gave Union Tuffy®

Now, The Maximum Safe Ton-Miles of Service Are Charted for Every Drilling Operation

No more guesstimating! It took 462 charts and more than 600,000 calculations, but oilfield wire rope cut-off procedures are now scientifically based.

Union Tuffy has it all figured for you. The IBM "705" electronic brain gave him the ton-mile charts that tell you the right time to cut the right length of rope. You can be sure of maximum safe service for any drilling operation, anywhere in the world.



In '52, Union originated the workable oilfield wire rope cut-off procedure that has saved the industry thousands of dollars and man-hours, prevented many costly fishing jobs. Now made all-inclusive by electronically computed charts.

118,360 Answers to Cut-off Procedures

All the variables are taken into consideration—drum diameters, derrick heights, drill collar and pipe sizes, rope diameters, design factors, mud or air drilling, etc. It's all charted, 118,360 answers.

For you it's all simple and easy. Out of the mass of figures you work only from a few charts, maybe 5 or 6. From these it's no trick to regulate the cut-offs for all your drilling operations. We'll send a fieldman with full instructions and the specific tables you need.

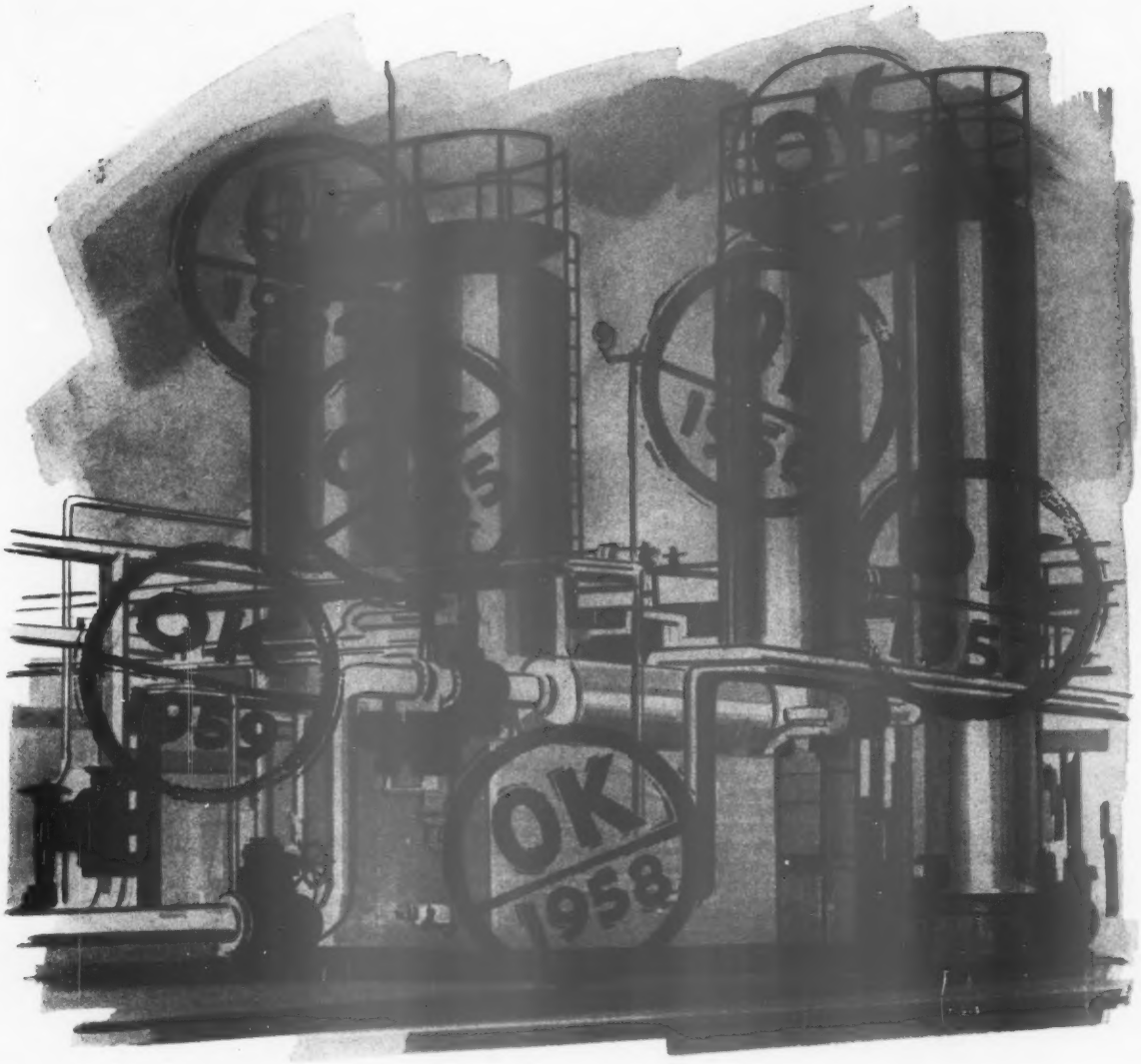
Scientifically right, too, are Union Tuffy Standard Rotary Line, Union Tuffy Jackknife Rotary Line and Union Oil Well Servicing Ropes including record breaking Uni-Core® Sand Lines. Union quality, flexibility and brute strength are fabricated into every powerful inch of them.

For fast, on-schedule delivery call your Union oilfield supply store.

Person-to-Person Field Service

We bring this new electronic engineering service right to you. Simply outline your drilling plans. This will enable us to select the exact charts your operation calls for and a trained Union fieldman will bring them to you. He will explain their use to you and your crew. No extra charge for this service. **Write Union Wire Rope, Armco Steel Corporation, 2102 Manchester Ave., Kansas City 26, Missouri.**

ARMCO **Union Wire Rope**



7 years of constant use...

and Davison Silica Gel still meets required dew point

In tower after tower, operation after operation, millions of cubic feet of natural gas are being dried in beds of Davison Silica Gel that were installed two, three and even seven years ago. In one large South Central gas treatment installation, Davison Silica Gel was still effectively removing moisture and maintaining satisfactory dew point after 29,690 consecutive hours on stream.

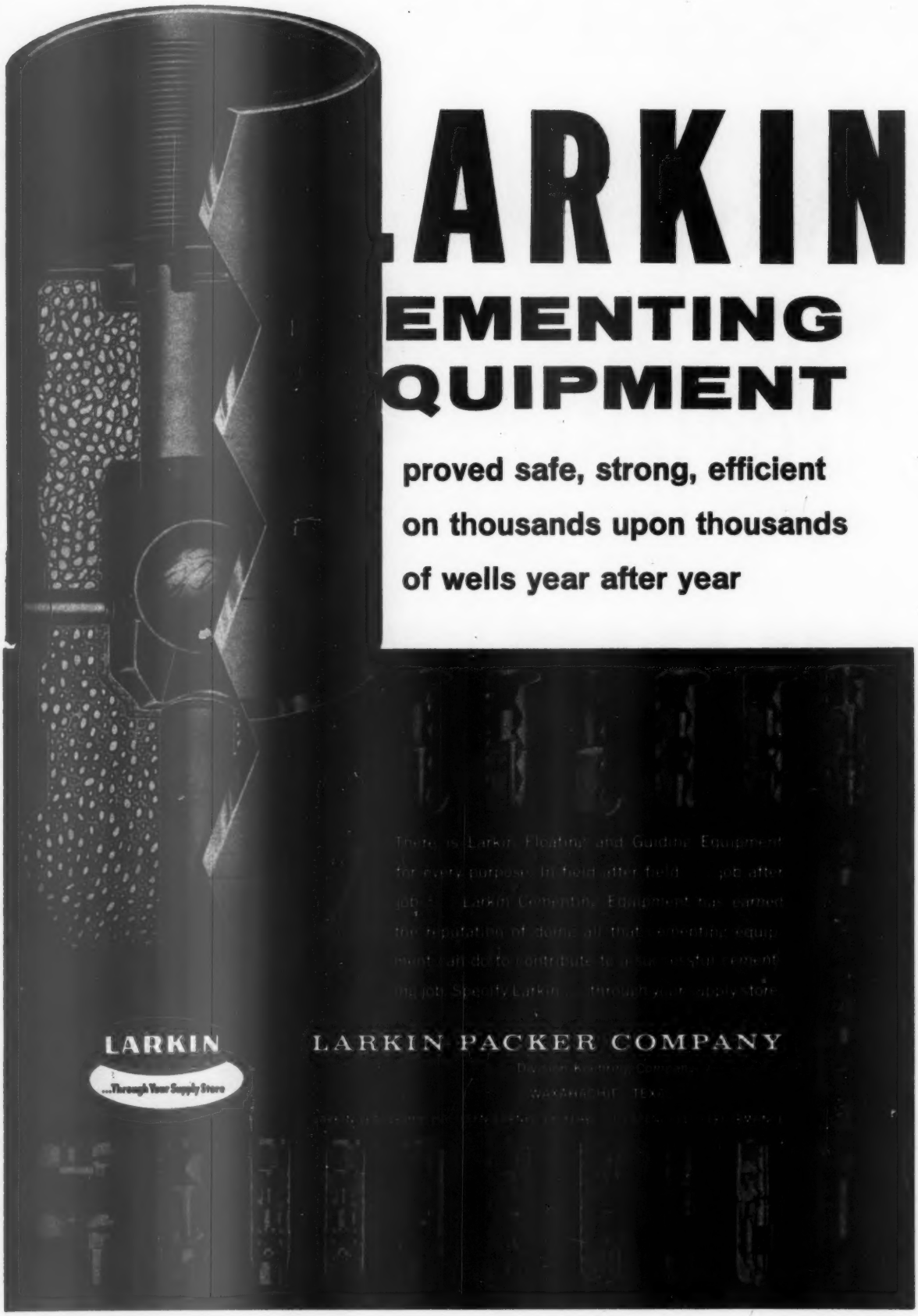
Davison Silica Gel's proven long-lived efficiency is one of the reasons it is being selected to replace other desiccants in increasing numbers of gas drying and hydrocarborn recovery installations. The higher purity of Davison Silica Gel reduces the possibility of carbon build-up in the desiccant pores. Higher purity, coupled with its larger surface area and granular form, has proven Davison Silica Gel to be an ideal desiccant.

For complete information on the advantages and profit-building potential of Davison Silica Gel for natural gas drying, write Dept. 3106.

GRACE

DAVISON CHEMICAL

Industrial Chemicals Dept. 3106, Baltimore 3, Md.


LARKIN
EMENTING
QUIPMENT
proved safe, strong, efficient
on thousands upon thousands
of wells year after year
LARKIN
...Through Your Supply Store
LARKIN PACKER COMPANY

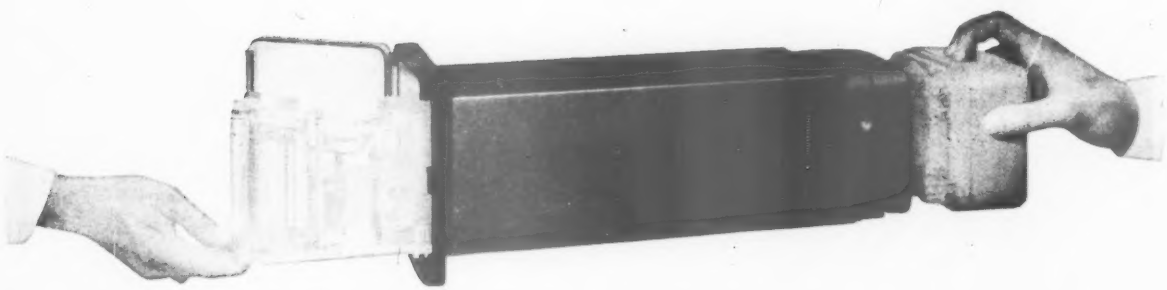
ANOTHER Money Saving Feature OF *Taylor Instruments*

FASTER DELIVERIES

You save up to six weeks delivery time on TRANSCOPE® Recorders and Controllers.

Here's how: We can ship you TRANSCOPE housings with manifolds within 2-4 weeks of receipt of your order. The unique plug-in features of the 90J pneumatic and 700J electronic recorders and TRANSCOPE controllers enable you to install these housings and make all necessary connections to the tagged manifolds while we complete manufacture of the instruments. You will then be ready to plug in recorder-controllers on delivery—approximately 4-6 weeks later—and be on stream immediately.

This saving in time is possible because the same plug-in features that enable us to ship the housings early permit our Production Department to build up a reserve stock of separate housings and built-in manifolds. We are geared to large quantity production that assures fulfillment of this delivery schedule.



Speedier delivery is another plus value of the TRANSCOPE line, now recognized throughout industry for its many outstanding features. Ask your Taylor Field Engineer, or write for Bulletin 98286 (pneumatic) or 98335 (electronic). Taylor Instrument Companies, Rochester, N. Y., and Toronto, Ontario.

Taylor Instruments **MEAN ACCURACY FIRST**

Cutaway shows the extreme simplicity of Darling's unique fully revolving double disc parallel seat gate valve principle.

YOU CAN DEPEND ON

Darling

For long-range economy on pipelines, standardize on Darling cast steel gate valves. The fully revolving double disc parallel seat and wedge construction automatically compensates for valve seat distortion, distributes disc and seat wear uniformly, and minimizes friction. These valves open fully and close easily even under severe pressure loads and radical temperature changes. *You can depend on Darling!*

The four working parts can be replaced without removing the valve from the line. You save valuable time when, after extended operation, it becomes necessary to service the valve.

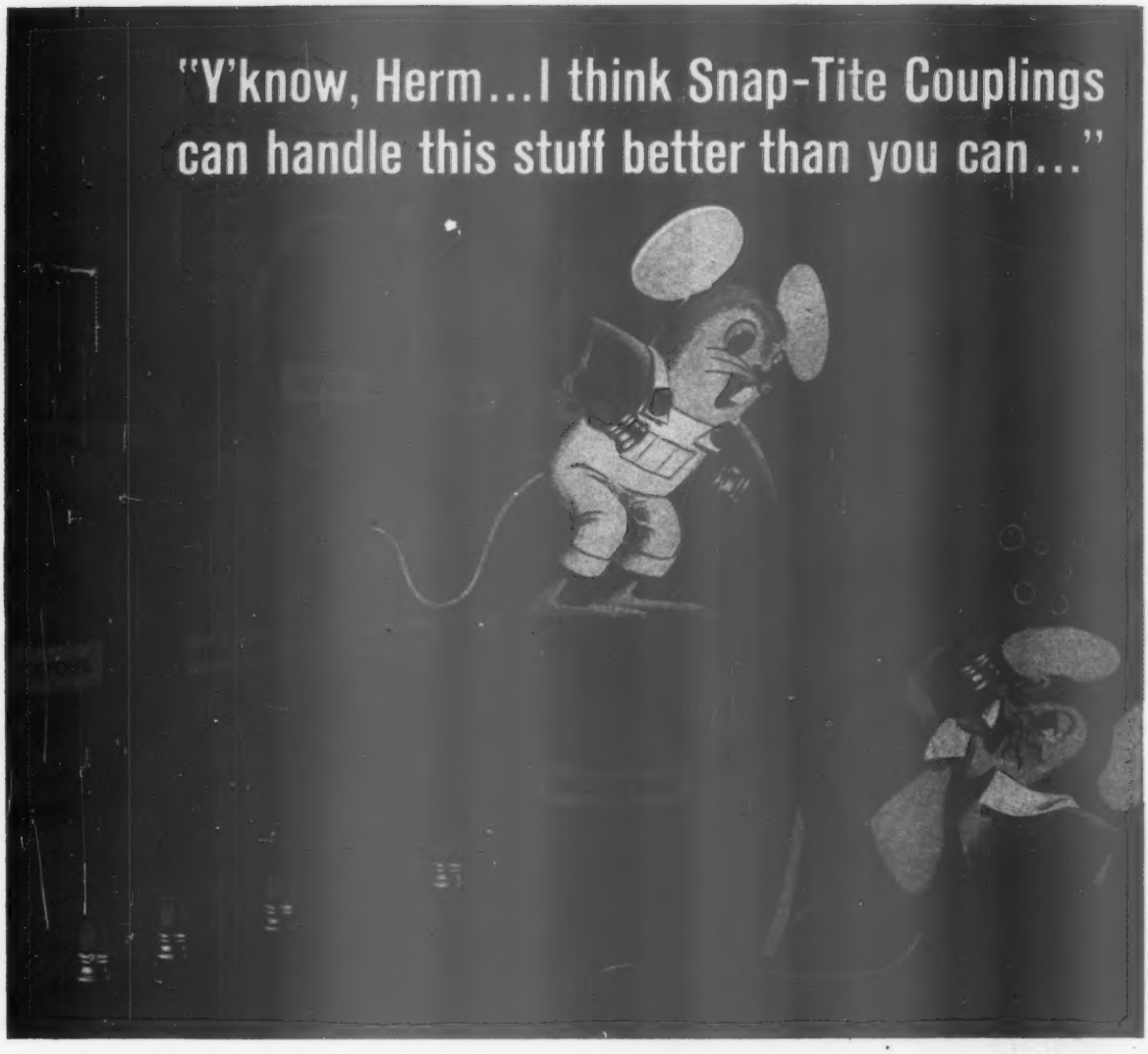
Write, wire or phone for detailed information on Darling gate valves—available in pressures and constructions for main and gathering lines, tank farm and other services.

DARLING VALVE & MANUFACTURING COMPANY

Williamsport 1, Pa.

Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario, Canada
Vannes Darling-France, 23 rue du Commandant Mouchotte, St. Mandé, France

GATE • BUTTERFLY • CHECK • SPECIAL VALVES • FIRE HYDRANTS

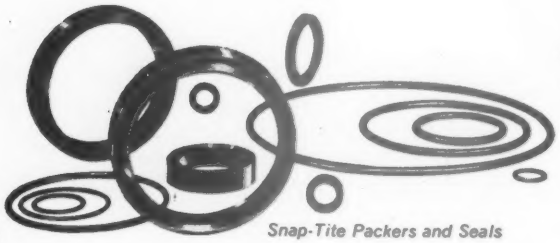


A complete choice of packers and seals permits Snap-Tite quick-disconnect couplings to handle over 600 different fluids! *(some of them mighty tough)*

Whatever fluid you're working with, chances are Snap-Tite couplings can handle it. Because every-one of the thousands of Snap-Tite quick-connect valved couplings comes with a wide choice of rubber packers and seals, selected according to the fluid in use. The right choice, of course, is vital for the seal is the very heart of the coupling.

To assist you in the proper selection of coupling seal material, Snap-Tite, with the assistance of suppliers of synthetic rubber materials, has recently compiled a comprehensive Packer Usage Guide —the first of its kind in the industry.

For the Packer Usage Guide, and for complete information on the correct choice of quick-connect, quick-disconnect couplings for the fluids *you* use, write Snap-Tite, Inc., Union City, Pa.



Snap-Tite Packers and Seals

☆ Snap-tite

UNION CITY, PA.

ST-61-02

K-8120

Nalco • PROVIDES COMPLETE CORROSION CONTROL ALL ALONG THE LINE

Gives Efficient and Economic Corrosion Protection Through Unique Program of Evaluation and Service

Nalco field man uses specially designed, portable testing equipment for precise measurement of inhibitor concentration at West Texas pumping station.

PIPELINE PROBLEMS CAUSED BY CORROSION

1. *PRODUCT CONTAMINATION*
2. *WEAR ON PUMP SEALS AND RINGS*
3. *LOW C FACTOR*
4. *FREQUENT PIG RUNS*

NALCO'S CORROSION CONTROL PROGRAM SOLVES THESE PROBLEMS!

Corrosion control in finished product pipe lines requires two things:

1. Effective *corrosion inhibitors*
2. *Injection at* economical *dosages*

Nalco's program covers both. "Star Performance" inhibitors protect your lines longer, and at lower dosages (as low as two pounds per 1000 barrels). And advanced evaluation techniques determine precise application points, optimum dosages.

COMPLETE EVALUATION— FROM REFINERY TO MARKET

Under normal pipeline operating conditions, sufficient inhibitor to maintain an adequate film is required. Nalco's thorough "on the spot" evaluation eliminates any guesswork, makes correct dosage a certainty. It includes:

1. *Coupon evaluation*
2. *Corrosometer® corrosion probe readings*
3. *Nalco's unique "N.I." test*

Coupons and probes monitor corrosion rates, and show the degree of protection afforded. The Nalco Inhibitor test, by measuring concentrations, enables you to obtain the most economical corrosion protection. And, since excess dosage of any surface active material disperses water and sediment into hydrocarbon, this Nalco analytical method of minimizing inhibitor dosage also guards against product contamination.

NALCO'S PROGRAM IN ACTION

PROBLEM: Corrosion and contamination of hydrocarbon, wear on pump seals and rings, reduced C factor, and frequent pig runs.

SOLUTION: Nalco inhibitor was injected initially at 10 pumping stations, corrosion coupons were evaluated at monthly intervals, and N. I. tests were run along entire line monthly by Nalco field men, as part of their normal service responsibility. After interim evaluation, injection points were reduced from 10 to 4, and initial dosage was reduced by 50% to 2½ lbs./1000 B!

RESULTS: Coupons showed no measurable corrosion, thus product contamination from this source was no longer a problem. In addition, wear on pump seals and rings was reduced substantially, C factor was improved, and frequency of pig runs was cut by 75 per cent.

Results like these are possible for you. Since Nalco fieldmen are located throughout the country, they can "provide complete corrosion control all along your line."

Call your nearest Nalco Representative, or write direct for details.

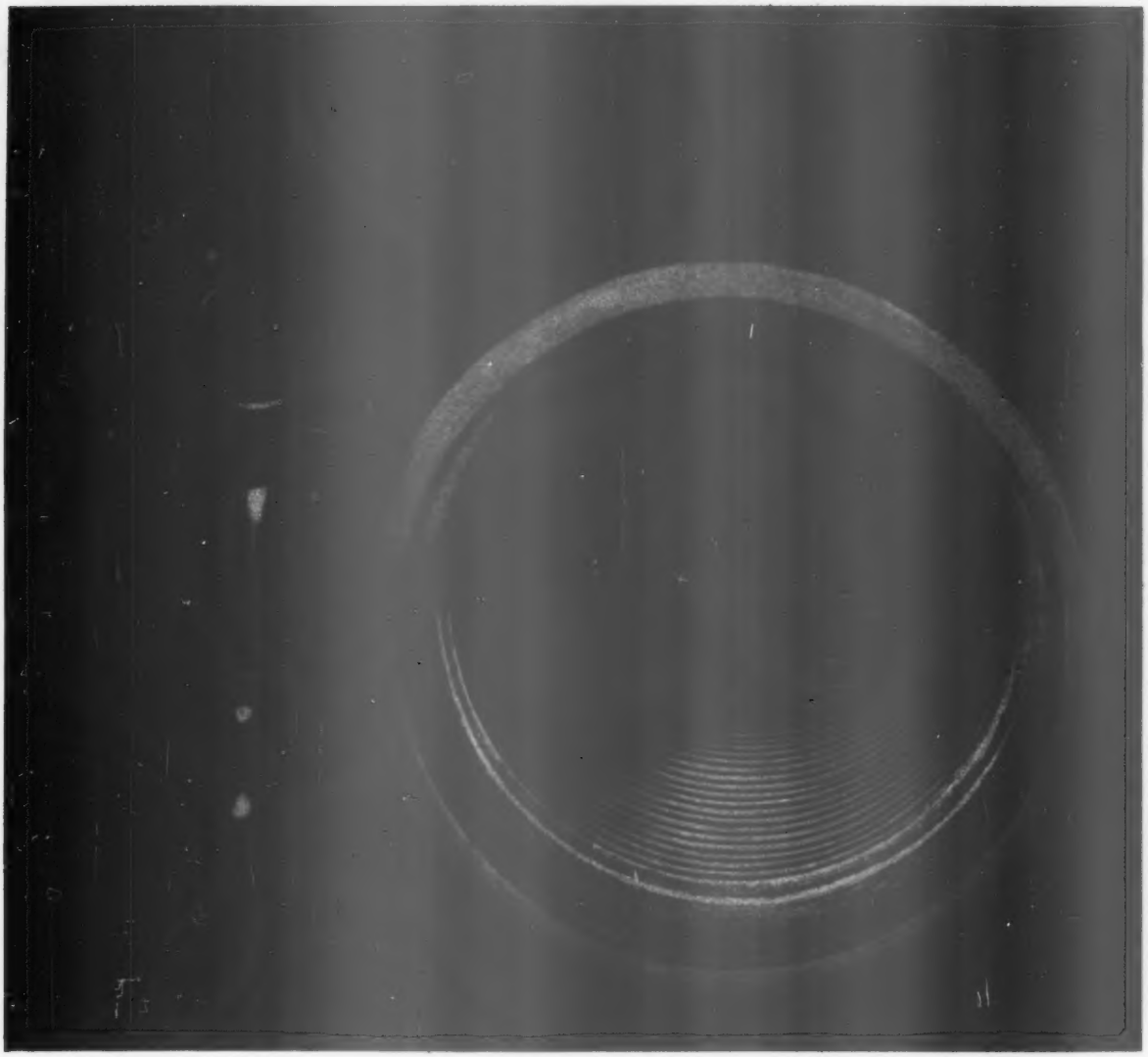
NALCO CHEMICAL COMPANY

6242 West 66th Place • Chicago 38, Illinois

Domestic subsidiaries: Visco Products Company, Houston, Texas
Howe-Baker Engineers, Inc., Tyler, Texas
Foreign subsidiaries: England, Italy, Mexico, Spain, Venezuela, and West Germany
In Canada: Alchem Limited, Burlington, Ontario

Nalco® ...Serving the Petroleum Industry Through Practical Applied Science

Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES



They've both got a "business end"

In a pistol it's the muzzle . . . and in oil country tubular products it's the threaded connections. This is a vital area that helps determine performance "life-or-death." And it's here that CF&I Seamless Casing and Tubing really has what it takes for success.

Every thread is cut by modern machinery — then checked by a contour microscope that determines absolute accuracy of angle and form. No weak links survive to render hundreds of feet of pipe worthless.

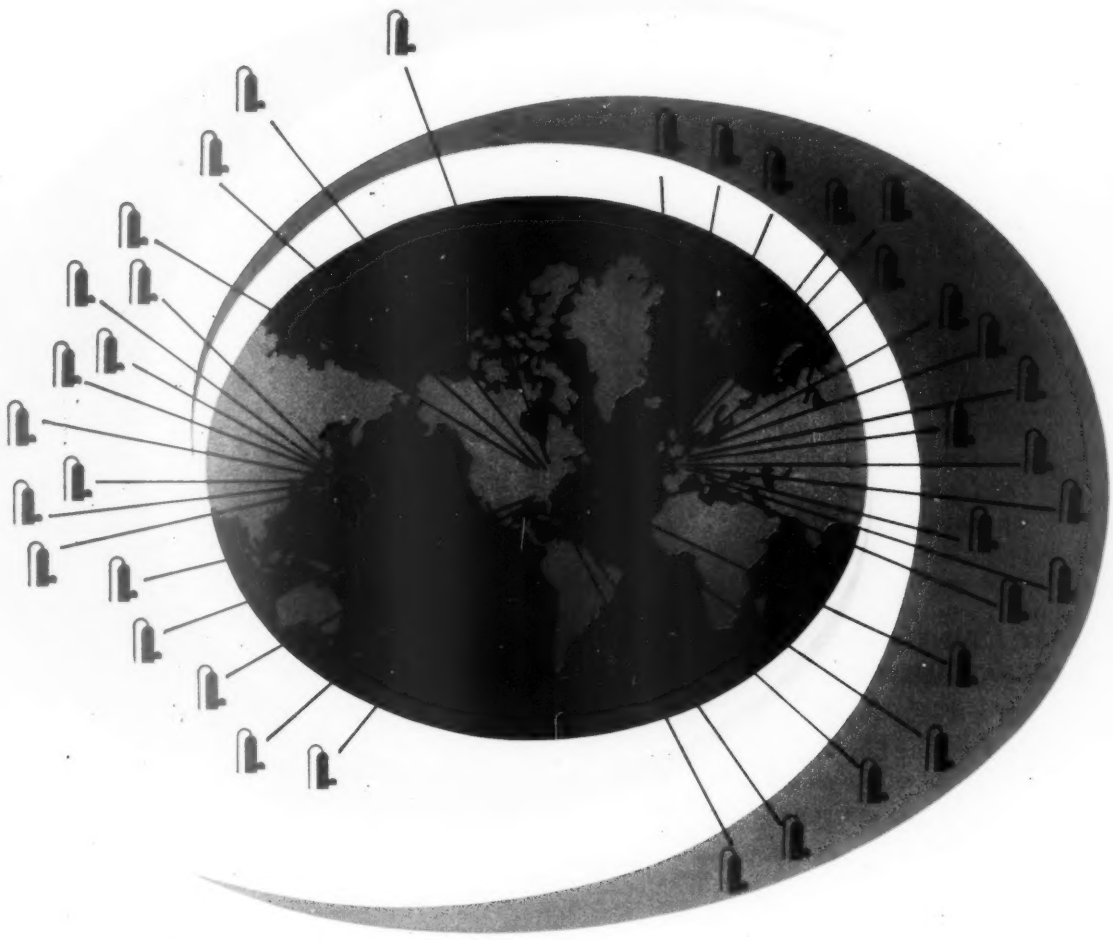
In short, CF&I Casing and Tubing holds up on the job, but never holds *you* up on the job. It's available in sizes from 2⅜" to 9⅝" O. D. and meets API specification STD 5A. Ask your CF&I salesman for complete details.

6232

The Colorado Fuel and Iron Corporation
Denver • Oakland • New York
Sales Offices in Key Cities

WORLD RECORD IN ETHYLENE!

Stone & Webster clients produce over
3.2 billion pounds of ethylene annually
in 37 plants in 12 countries.



This world record of ethylene engineering
experience is available to you.
Call or write our nearest office.

STONE & WEBSTER ENGINEERING CORPORATION

Affiliated with Stone & Webster Engineering Limited (London)

New York, 90 Broad Street — Boston, 49 Federal Street

Chicago Houston San Francisco Los Angeles Seattle Toronto Calgary

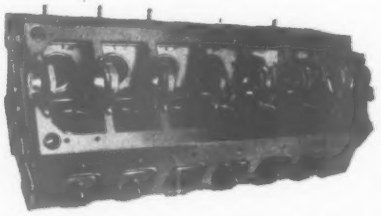
ROILINE GAS ENGINES

are advanced, dependable, and proven in Oil Field Service.

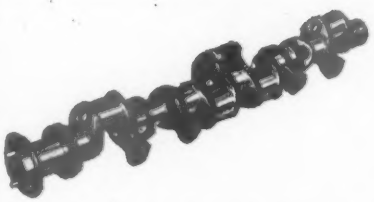
In-line 6, V-8, or V-12 cyls.—up to 706 hp.

HEAVY DUTY... LONG LIFE

A look inside these engines reveals the rugged construction that can be relied upon for dependable service.



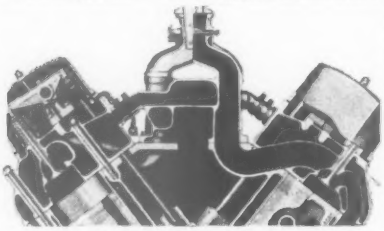
Internally ribbed crankcase gives solid crankshaft support. Extra rear main bearing absorbs side thrust.



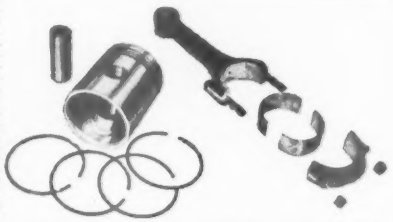
Large diameter, short in length, the rugged counterbalanced crankshaft handles power without vibration. It has generous bearing areas.

MORE POWER... BETTER ECONOMY

These ROILINE engines are modern, powerful, economical—designed throughout for gas operation.



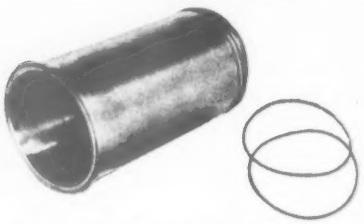
The "Easy Flow" manifold design provides perfect fuel and air distribution to all cylinders through large individual intake ports.



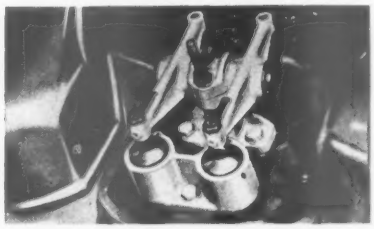
Aluminum pistons are taper cam ground. Full floating piston pins. Connecting rods have big wear-resisting replaceable bearings.

EASY MAINTENANCE... QUICKLY SERVICED

All wearing parts have replaceable bearing surfaces. *All* routine maintenance points are readily accessible.



Long wearing cylinder sleeves are easily replaced and cost far less than reboring cylinder block and installing oversize parts.

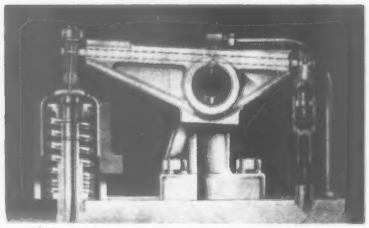


Cylinder heads can be removed by one man without disturbing manifold, carburetor, or controls. Note guided valve mechanism.

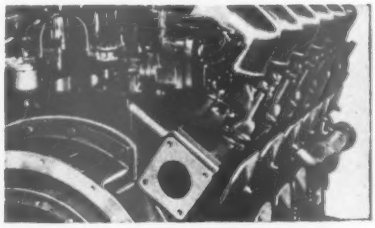
SMOOTH—QUIET... CLEAN—COOL

Benefits from newest design features mean more comfortable operating conditions and easier maintenance.

505 *Write for literature*



Hydraulic "Zero-Lash" lifters eliminate noise and adjustments and extend valve life. Engines are practically vibration-free.

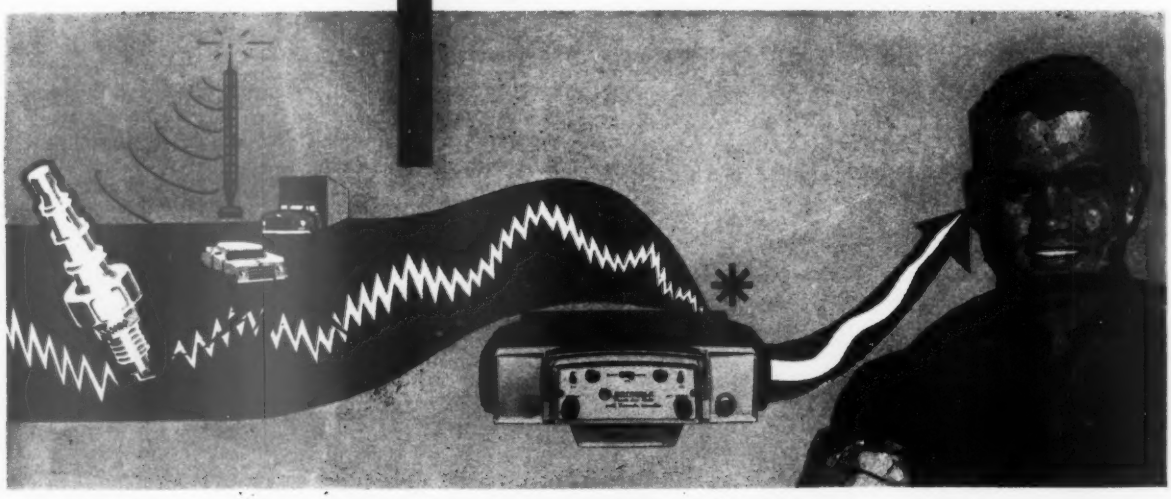


Exhaust manifold is water cooled and integrally cast into the crankcase to provide cooler operating area and fast warm-up of the engine.

WAUKESHA MOTOR COMPANY, WAUKESHA, WISCONSIN / **New York • Tulsa • Los Angeles**

Factories: Waukesha, Wisconsin and Clinton, Iowa

new...Motorola MOTRAC radio with EXTENDER operation



✱ CUTS OUT IGNITION NOISES

Dramatically Improves Overall Efficiency In 24-50 mc 2-Way Radio Systems

Motorola MOTRAC radio with Extender operation puts ignition noise suppression where it does the most good—built right into the receiver. Here it suppresses ignition noises from your own vehicle as well as those in the vicinity... providing the answer to the biggest problem in low-band 2-way radio systems today.

First and foremost, Extender operation improves reception throughout your system. In as much as ⅘'s of your territory, ignition noises can garble your messages. Now messages are clear. "Hash" caused by ignition noise is gone. *Second*, you can "extend" useable operating range where ignition noises are high. Motorola Extender operation suppresses disrupting ignition noise on weak, fringe area signals allowing the message to come through clearly—right out to the limits of your radio coverage. *Third*, you can reduce interference from other radio systems (extraneous messages, ringing and other noise interference known as intermodulation)... just flip the switch on the control head.

"MOTRAC" is a trademark of Motorola Inc.

HEAR FOR YOURSELF

Send in coupon NOW
for a free, on-the-job recording...
listen to the dramatic
difference in message clarity.

Motorola Communications & Electronics, Inc.
4501 Augusta Blvd., Chicago 51, Illinois
A Subsidiary of Motorola, Inc. Dept. AOG126

☐ Send me phonograph record

☐ Have salesman phone for appointment

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

MOTOROLA 2-WAY RADIO

New time multiplexing and remote and reduce line requirements for

Five new basic time multiplexing systems—and a new remote index setting feature—add to the overall versatility of *Dur-O-Pulse* . . . give you advantages available in no other telemetering system.

With Time Multiplexing Units—

- You can transmit up to 15 signals either in one or two directions over a single channel.
- You can add intermediate stations without adding any additional transmission lines.

With Remote Set Index—

- Easy to set—set the index, push a button and the rest is automatic: a pulse whose duration is directly proportional to the value of the set point is transmitted to remotely located controllers.
- Can be used as part of a multiplexing system.

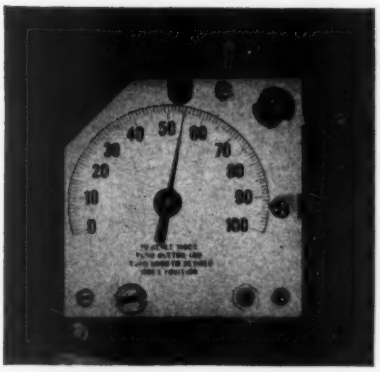
The *Dur-O-Pulse* system measures and transmits process variables such as pressure, temperature, flow, level, voltage, current, power and speed. It can send data quickly and accurately over all types of circuits.

set index setting simplify operation Dur-O-Pulse telemetering systems

- Gives you set point indication at transmitting and receiving instruments.
- A single tone is required for the index signal when audio tone multiplexing is used.

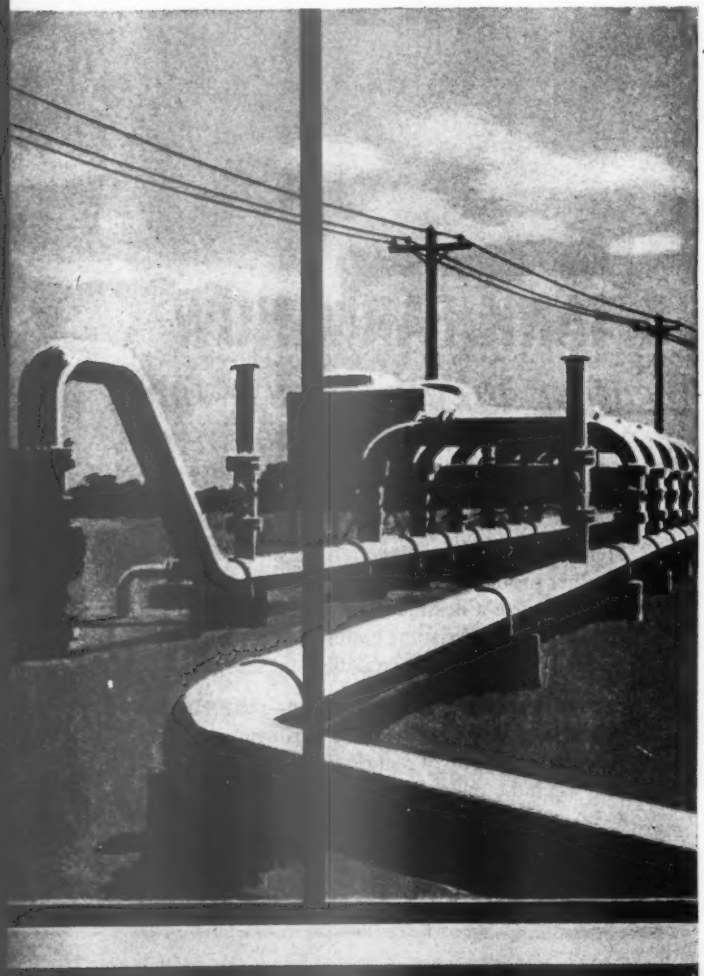
Find out about *all* the performance and maintenance advantages of *Dur-O-Pulse* from your nearby Honeywell field engineer. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa. In Canada, Honeywell Controls, Ltd., Toronto 17, Ontario.



REMOTE-SET INDEX TRANSMITTER eliminates separate push buttons or switches needed to drive controller index up or down scale. To readjust controller index it is necessary only to adjust the indicating pointer to the desired set point and push the start button.

TIME MULTIPLEXING UNITS transmit up to 15 variables in one or both directions and provide a synchronizing signal to keep transmitting and receiving units in step.



Honeywell

First in Control

SINCE 1885

MODERNIZE YOUR TANK FARM NOW

with the new Varec All-Weather Breather Valve that works perfectly in -60° winters and +125° summers.

Here's all-weather performance that's been *proven* through two full years of Eastern Canada's roughest climate...frigid winters...hot, humid summers. Yet never once did Varec's rugged new Fig. 2000-61 ALL-WEATHER Breather Valve fail to operate perfectly. What's more, this petro-chemical plant can look forward to the continuation of this 100% performance for many tough seasons to come.

By modernizing your tanks with this new Varec ALL-WEATHER Breather Valve, you are now assured of tank safety and vapor saving efficiency *the year around.*

NEW FIG. 2000-61 MODEL...
TWO-WAY PROTECTION AGAINST FREEZE-UP.

Here's how Varec engineers have solved the cold-weather problem: First, both pressure and vacuum pallets utilize a flexible diaphragm of special non-frosting, icing-resistant material. This eliminates possible freezing between pallet and seat ring.

Second, a special non-frosting, icing-resistant compound is used to coat the pallet perimeter and stem, guide-posts and tip of seat ring. Ice and snow scrape free when the pallet lifts.

For complete information on the Varec Fig. 2000-61 ALL-WEATHER Breather Valve, write for Varec Bulletin No. CP-2701, Dept OGJ-1500-2.

Varec
TRADE ® MARK

THE VAPOR RECOVERY SYSTEMS COMPANY
2820 North Alameda Street · Compton, California

Branches and Representatives in Principal Cities

NEW

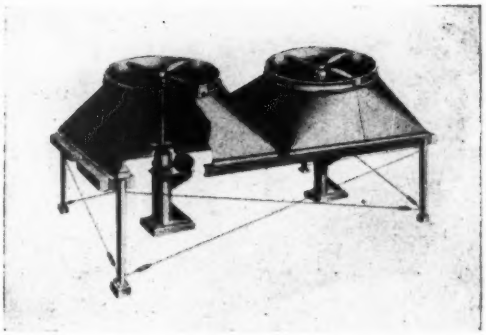
Cutaway View of G-R Forced Draft Fin-Fan Air Cooled Heat Exchanger.

G-R Fin-Fan AIR-COOLED HEAT EXCHANGERS

● New design employing four point suspension permits the air moving equipment to be supported on pipe racks or other over-head structures leaving the ground area underneath for use of other equipment.

These air-cooled heat exchangers eliminate the initial, operating and maintenance costs of water pumps, piping, valves and water treatments; and minimize fouling and corrosion problems. They provide efficient, low cost cooling when water is scarce; and are often preferred when water is readily available and inexpensive.

Installations range from single units to those with more than one-quarter billion square feet of heat transfer surface at a single site. Easily installed. Vacuum to 6000 psig, temperatures to 1600°F. Highly endorsed by leading refineries, pipe lines and engineer-contractors.



Cutaway View of G-R Induced Draft Fin-Fan Air Cooled Heat Exchanger.

Get full details! Write for a copy of Bulletin No. 2401 today.

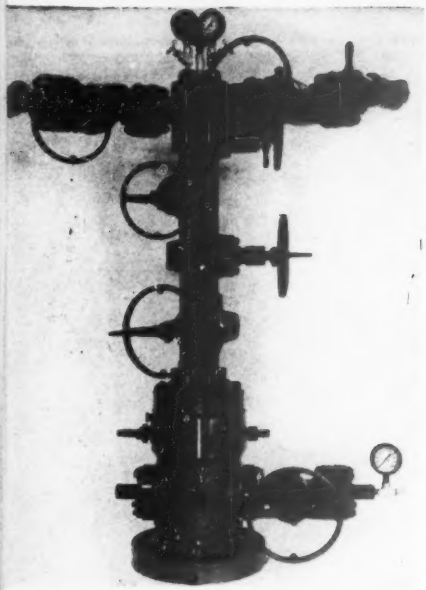
The Griscom-Russell Co.
MASSILLON, OHIO

Affiliated with
C. H. WHEELER MFG. CO.
PHILADELPHIA 32, PENNA.

Engineering and Sales Representatives in the Principal Cities

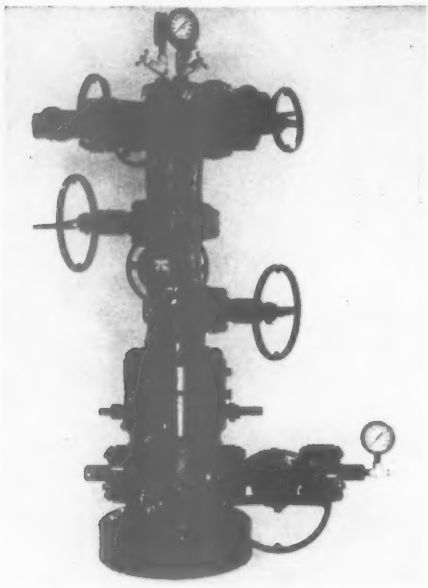
KLIPFEL VALVES, INC. • SMART-TURNER MACHINE CO. LTD. *Affiliates*

Shell and Tube Heat Exchangers | Sectional Heat Exchangers | Air Cooled Heat Exchangers | Tank Heaters | Steam Condensers and Ejectors | Single and Multi-Stage Pumps | Marine Auxiliary Equipment



3000# W.P. Triple Completion Tree with Cameron Type "F" Recessed Body Master Valves with integral 5 bolt flanges. Wing valves are Cameron Flanged Type "F." Bolted tees increase rigidity.

Cameron

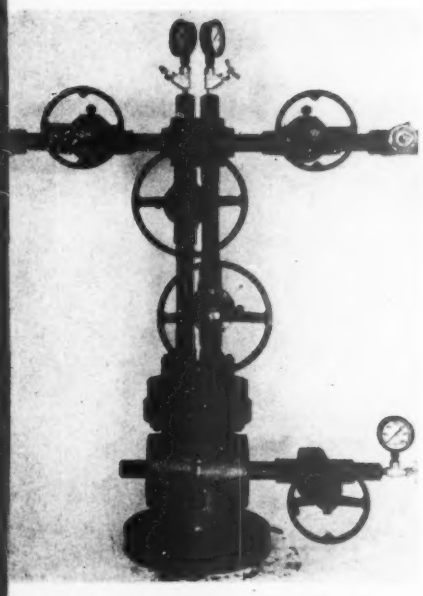


5000# W.P. Triple Completion Tree with Cameron Solid Block Tree Valve. A master valve, wing valve and tee for each completion are integral in the Solid Block Tree Valve body.

Cameron

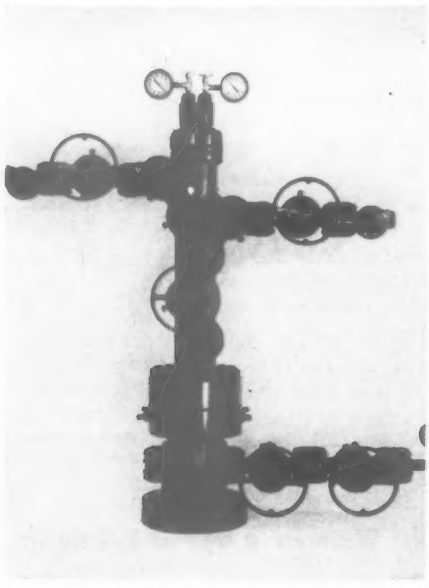
5000# W.P. Dual Completion Tree with Cameron Solid Block Tree Valve. Two master valves, a swabbing valve, wing valve and tee for each completion are integral in the Solid Block Tree Valve body.

Cameron



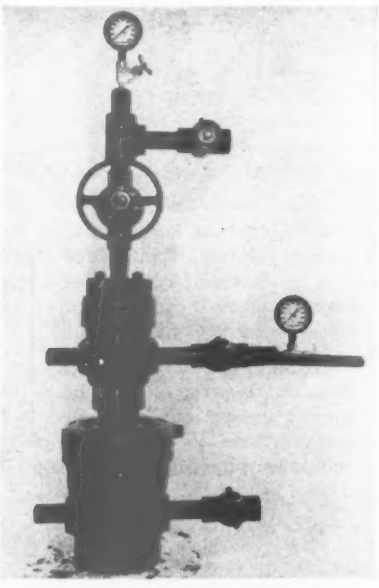
2000# W.P. Dual Completion Tree with Cameron Type "F" Recessed Body Screw End Master Valves and with Cameron Type "F" wing valves. Tees are bolted together for increased rigidity.

Cameron



10,000# W.P. Dual Completion Tree with Cameron Solid Block Tree Valve. Two master valves, a wing valve and tee for each completion are integral in the Solid Block Tree Valve body.

Cameron

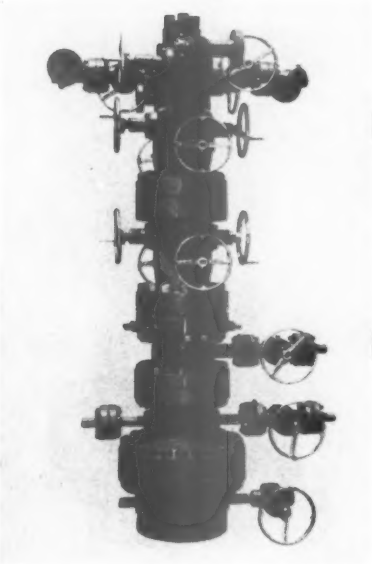


2000# W.P. Single Completion Tree Assembly with Cameron Type "L" Tubing Head and with Cameron Type "F" Master Valve. Cameron Ball Valves are on outlets of tubing head and casing head.

Cameron

For the safety of your well investment – For trouble-free operation – For long-run economy – Have the entire wellhead assembly made by Cameron. Then there is only one responsibility and one guarantee. Cameron's hydraulic forging presses impart superior grain structure to its products. Quality is assured by Cameron's 40 years experience, modern plant facilities and rigid inspection.

COMPLETE PRODUCTION CONTROL



5000# W.P. Quadruple Completion Tree with Cameron Quadruple String Solid Block Master Valve and with Cameron Quadruple String Solid Block Cross Type Valve.

Cameron's single or multiple completion Christmas trees have set new standards of safety and flexibility in wells throughout the world. Cameron's exclusive Rotating Seat Gate Valves give a "bubble-tight" seal for an amazing number of operations. Cameron Solid Block Tree Valves – made practicable by the rotating seat design – make your tree more compact, cheaper and safer. Cameron has sales representatives and warehouses distributed throughout the oil country, worldwide. Trees are fabricated in seven plants. *For maximum security and economy, let Cameron furnish your next trees.*

Cameron

CAMERON IRON WORKS, INC.

P. O. Box 1212 Houston, Texas

Plants and Sales Offices throughout the world

THE BOLD NEW SERIES "60"

New truss design

for maximum rigidity and strength per pound of structure—maximum torque and well-load capacity per unit of weight.

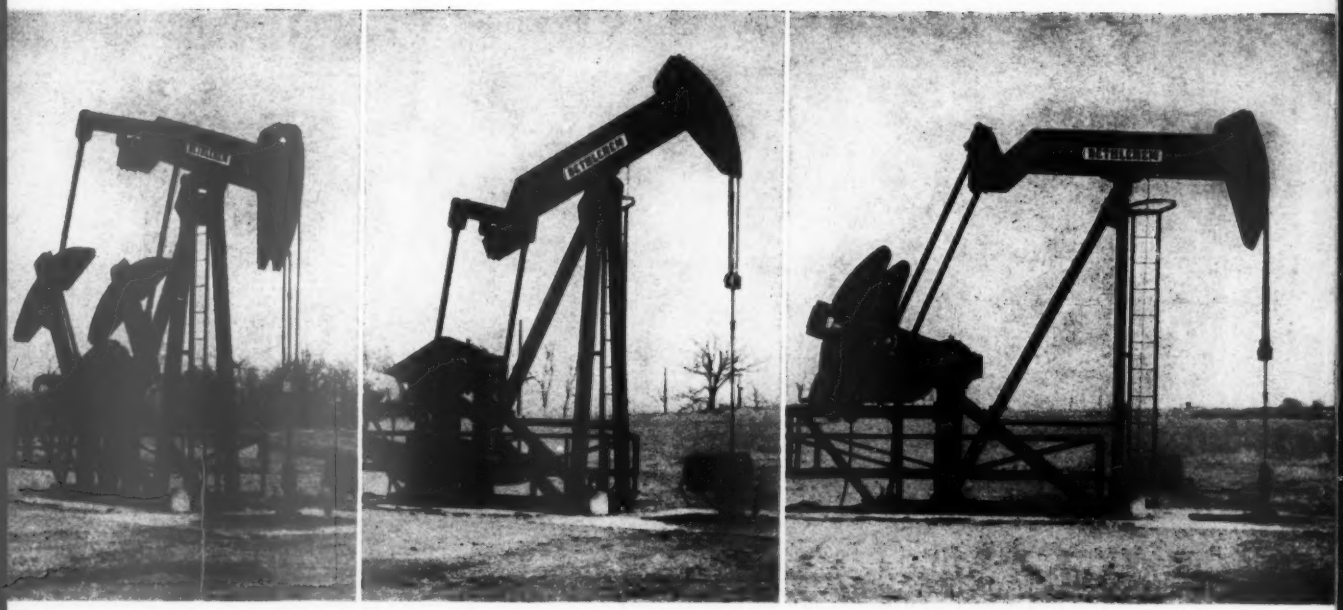
Improved gear reducer

with maximum accuracy of gear bearing-shaft alignment—high-torque gear train—immediate lubrication.

BETHLEHEM STEEL

New engineering throughout

for maximum operating economy—new servicing features—new counter-balance cranks—new equalizer mounting—pre-lubricated bearings—hydraulic wrist-pins.



The Bethlehem Series "60" is new from the base up for top economy, wide flexibility, easy maintenance. If you'd like more details, send us the coupon. Or check with the Bethlehem office or store in your area.

BETHLEHEM STEEL COMPANY, SUPPLY DIVISION
21 East Second St., Tulsa, Okla.

Please send me your new Booklet 1669, introducing the Bethlehem Series "60" pumping unit.

*Name & Title*_____

*Company*_____

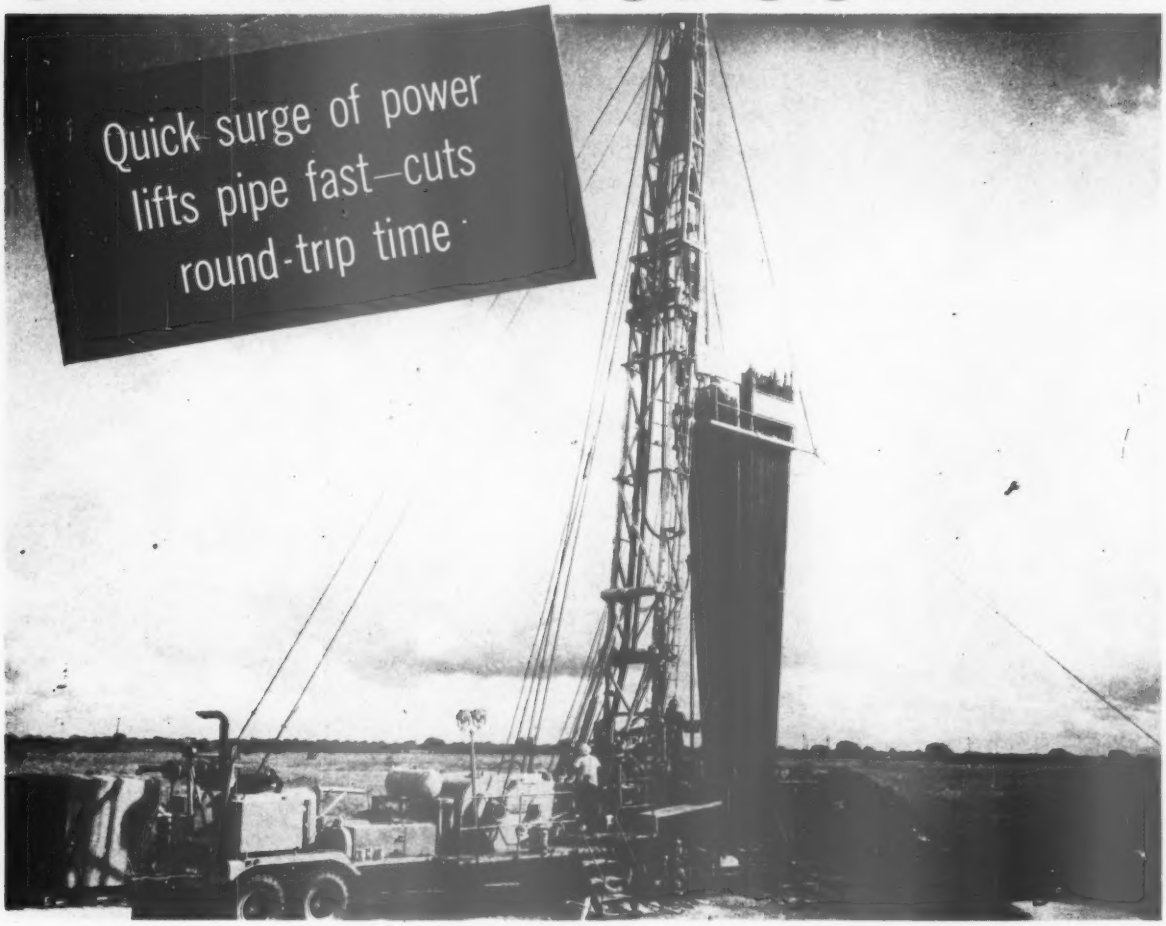
*Address*_____

*City & State*_____

Bethlehem Steel Company, Supply Division
General Offices and Export Dept., 21 East Second St., Tulsa, Okla.
Canadian Distributor: Bethlehem Supply Company of Canada, Ltd., Calgary, Alberta, Canada

BETHLEHEM STEEL
SUPPLY DIVISION

GET REAL PRODUCTIVITY



"We can run into the hole 4 joints per minute in singles and come out at the rate of 3 joints per minute, even with a long string. The quick surge of power with the 'Jimmy' gives us a fast lift of the pipe coming out of the hole on 6,000- to 10,000-foot wells."

That's R. T. "Sparky" Sparkman talking about this new GM Diesel powered IDECO Rambler "drive-in" rig. Mr. Sparkman is Vice President and General Manager of Victoria Well Service, Inc., Victoria, Texas. The rig is used for work-over on oil and gas wells, has split tubing elevators and uses a Model FXO Gardner-Denver mud pump

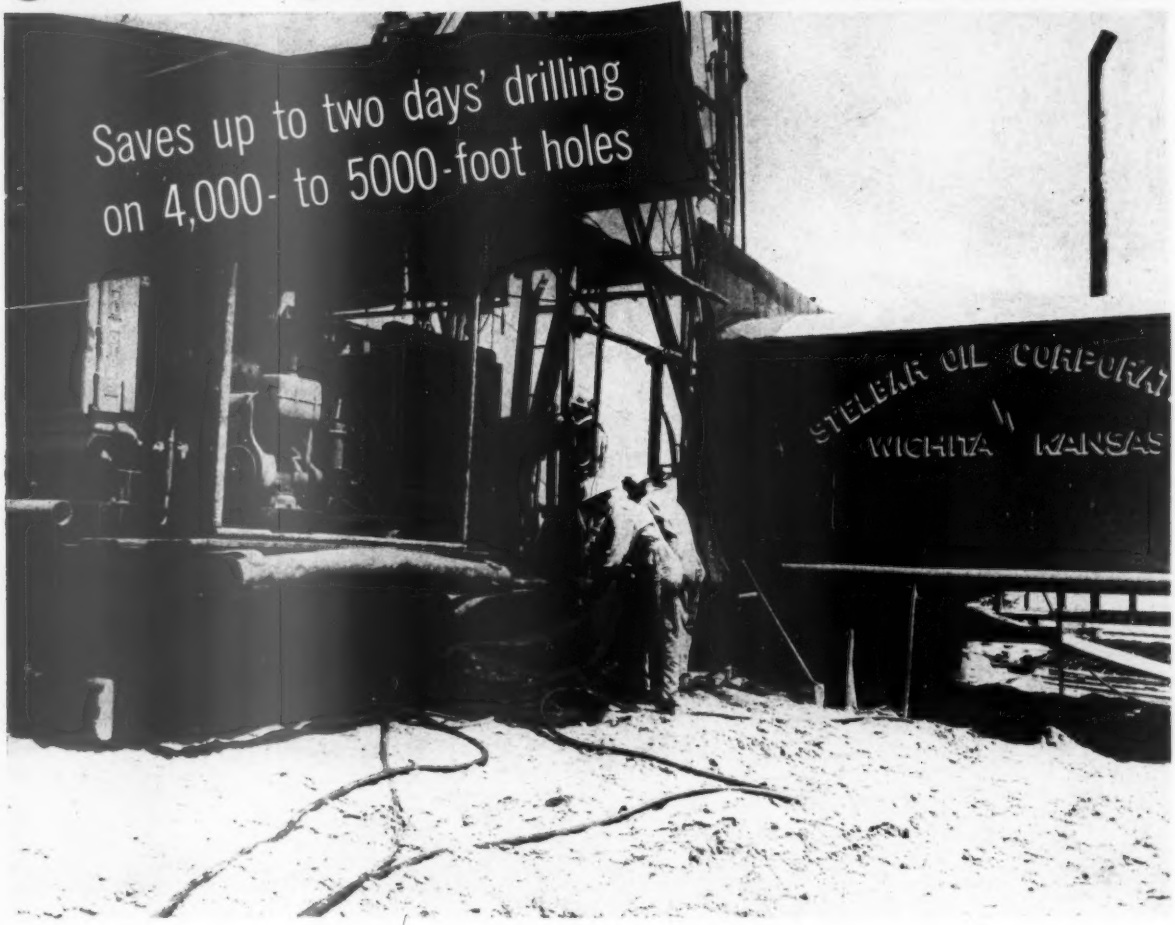
Mr. Sparkman specified GM Diesel "6-71's" on this new rig because of his long experience with "Jimmys." He has another GM Diesel powered IDECO Rambler that has worked every day since January, 1959, with no trouble of any kind. "We haven't even had to replace a fuel injector," he says.

How about you? Ready to repower or buy new equipment? Like Mr. Sparkman, you'll find that the fast-accelerating GM Diesels can cut your drilling time and help you make more hole and more profit.

See your nearby GM Diesel Distributor. He's in the Yellow Pages under "Engines, Diesel." Or write for more information.

GM DIESEL ALL-PURPOSE

GET A GM DIESEL ENGINE



"With the GM Diesels we now have more power on the same skids. We get enough extra power to save up to two days' drilling time on four- to five-thousand-foot holes."

That's the report from Ralph Rowe, Drilling Superintendent, and Glen Conway, Driller for Stelbar Oil Corporation, Inc., Wichita, Kansas, since they replaced the competitive Diesels on this rig with two GM "6-71 twins."

They also say, "With the 'Jimmys' we have the power to turn more weight on the bit. Their quick response gives us faster round trips and we have more than enough power to maintain the mud pressure we need, even on bottom."

Stelbar Oil is driving an N-4 Brewster drawworks with one "6-71 twin," a 7″ x 12″ Gardner-Denver mud pump with the other unit.

If you'd like to increase the productivity and profit from your rigs, put GM Diesels to work for you. You'll get more power with less weight and space, faster response, less down-time, faster moves and rig-ups, and more hole per tour

See your GM Diesel Distributor. He's in the Yellow Pages under "Engines, Diesel," or write for more information.

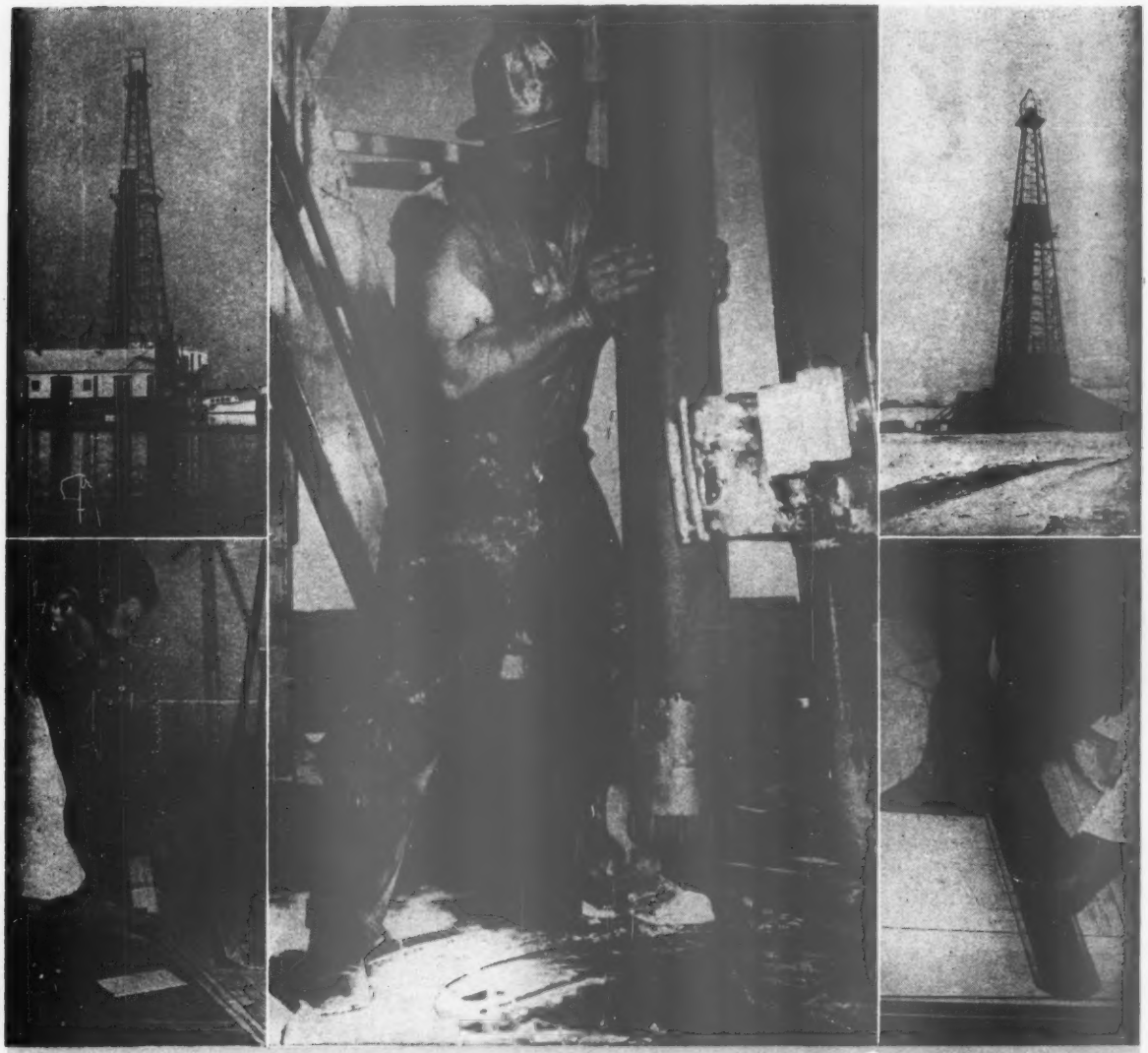
GM DIESEL

DETROIT DIESEL ENGINE DIVISION,
GENERAL MOTORS, DETROIT 28, MICH.

In Canada: GENERAL MOTORS DIESEL LIMITED, London, Ontario
Parts and Service Worldwide

POWER LINE

Sets the standard of Diesel productivity



Operate at "Less cost per foot"

With manufacturing plants throughout the world Christensen can design and deliver your "engineered" diamond bit, on time, regardless of your job location.

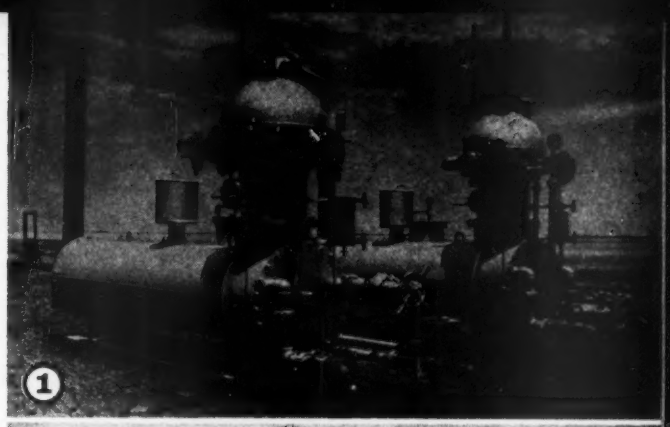
"Less cost per foot"

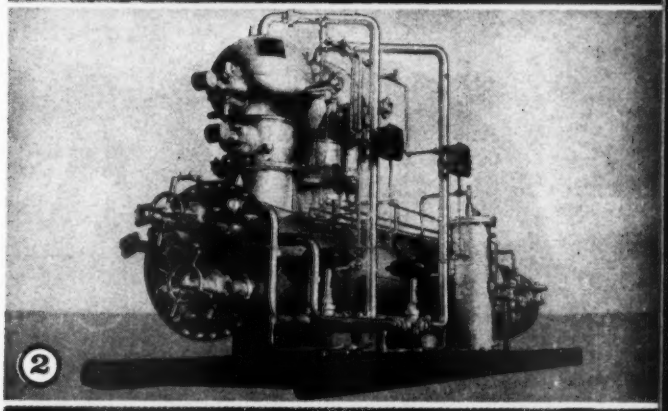
CHRISTENSEN DIAMOND PRODUCTS

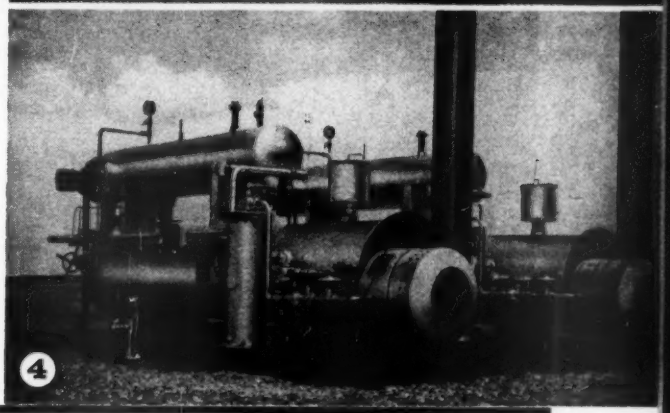
MAIN OFFICE AND PLANT 1937 SOUTH 2nd WEST
SALT LAKE CITY, UTAH

SERVICE FROM WORLD-WIDE SALES OFFICES AND MANUFACTURING PLANTS

PREVENT FREEZ-UPS SHUT-DOWNS and SERVICE CALLS with FREE-O-FREEZ™







There is a BS&B FREE-O-FREEZ unit designed to solve your cold weather production problems:

1. *The spherical FREE-O-FREEZ heats the well stream in the heater flow coil to prevent freeze-ups and hydrate formations. The water-oil separator section is immersed in the hot water bath of the heater. This unit has been very popular on leases where all-weather operation is a must.*

2. *The "Double Dip" is identical to the spherical FREE-O-FREEZ except that it processes two well streams in the same unit at the same time.*

3. *This versatile unit designed to handle gas streams containing viscous fluids that tend to foul the operation of conventional equipment. This is another example of how BS&B engineering and know-how solves difficult production problems.*

4. *The horizontal FREE-O-FREEZ is recommended for leases where there are surge problems. Inlet gas heat is utilized to keep liquid from freezing in the separator. This is accomplished by piping the inlet gas through a coil in the liquid section of the separator.*

FREE-O-FREEZ units are Compact, Skid-mounted, and provide Dependable, Automatic, Trouble-free operation in all types of weather. FREE-O-FREEZ units are equipped with a safety first—the BS&B flash arrestor which eliminates flash backs and provides maximum burner safety.

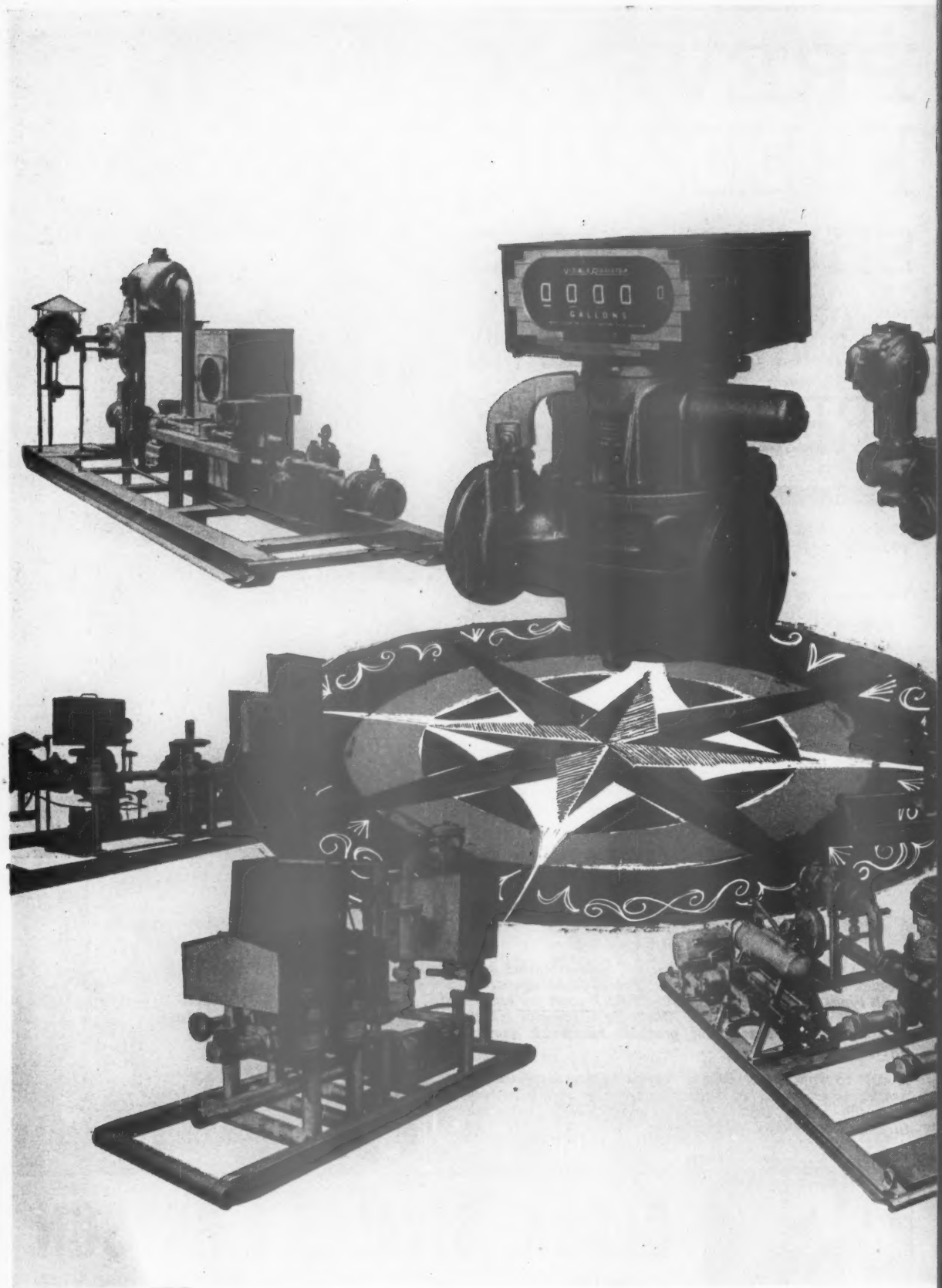
A call to your local BS&B representative is all that's needed to end your cold weather lease production problems: Or write: BS&B, Dept. 1-A6B, 7500 East 12th Street, Kansas City, Missouri.

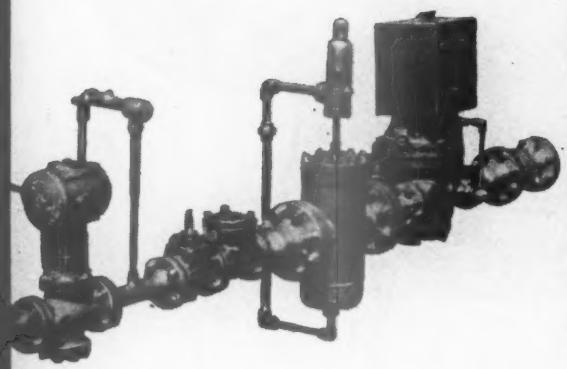
FREE-O-FREEZ is a trademark of BS&B

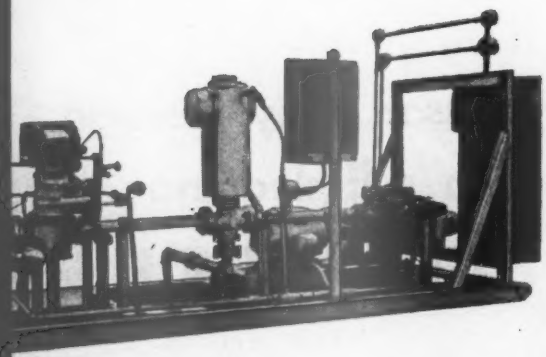
BS&B

BLACK, SIVALLS & BRYSON

OKLAHOMA CITY • KANSAS CITY • TULSA • EDMONTON • THE HAGUE


GALLONS





NO LACK OF L.A.C.T.

LEADING COMPANIES EVERYWHERE KEEP THE RECORD STRAIGHT WITH L.A.C.T. METERS BY A. O. SMITH

It's the automatic choice at lease holdings from coast to coast – Lease Automatic Custody Transfer systems with precision metering by A. O. Smith.

As close to foolproof as modern science can make them, A. O. Smith L.A.C.T. meters afford undisputable transfer evidence for royalty owner, producer, pipeliner, etc. Economical, too! L.A.C.T. systems do away with costly lease tankage systems... reduce manpower required to hand gauge tanks.

A. O. Smith leads in L.A.C.T. as it does in metering all along the line. Pick a transfer point! Well-site . . . refinery . . . bulk plant . . . truck . . . service station – you can be sure of uninterrupted high flow and sustained accuracy with A. O. Smith meters on the job. For the complete meter story, contact your representative or write direct.

Through research ...a better way

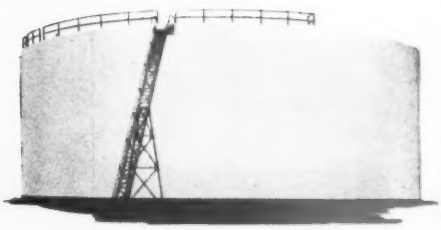
A.O.Smith

CORPORATION

METER AND SERVICE STATION EQUIPMENT DIVISION

Factory: 1602 Wagner Ave., Erie, Pennsylvania. Offices: Atlanta 5, Ga.; Chicago 3, Ill.; Houston 2, Texas; Los Angeles 22, Calif.; New York 17, N.Y.; Newark, Calif.; Tulsa, Okla. Canada: Toronto 12, Vancouver 1. A. O. Smith INTERNATIONAL S.A., Milwaukee 1, Wis., U.S.A.

RAIN is another reason why storage tanks should be painted with self-cleaning Pittsburgh White TANKHIDE®!



• **Rain, instead of harming White TANKHIDE,** actually helps it cleanse itself, and thus maintain its brilliant whiteness.

• **This whiteness is important.** It comes from intensely white *titanium* pigments in the special TANKHIDE formula, and results in unusually high solar reflectance—ability to turn away the sun's blazing heat. Thus, TANKHIDE helps reduce costly evaporation losses of petroleum products from storage tanks.

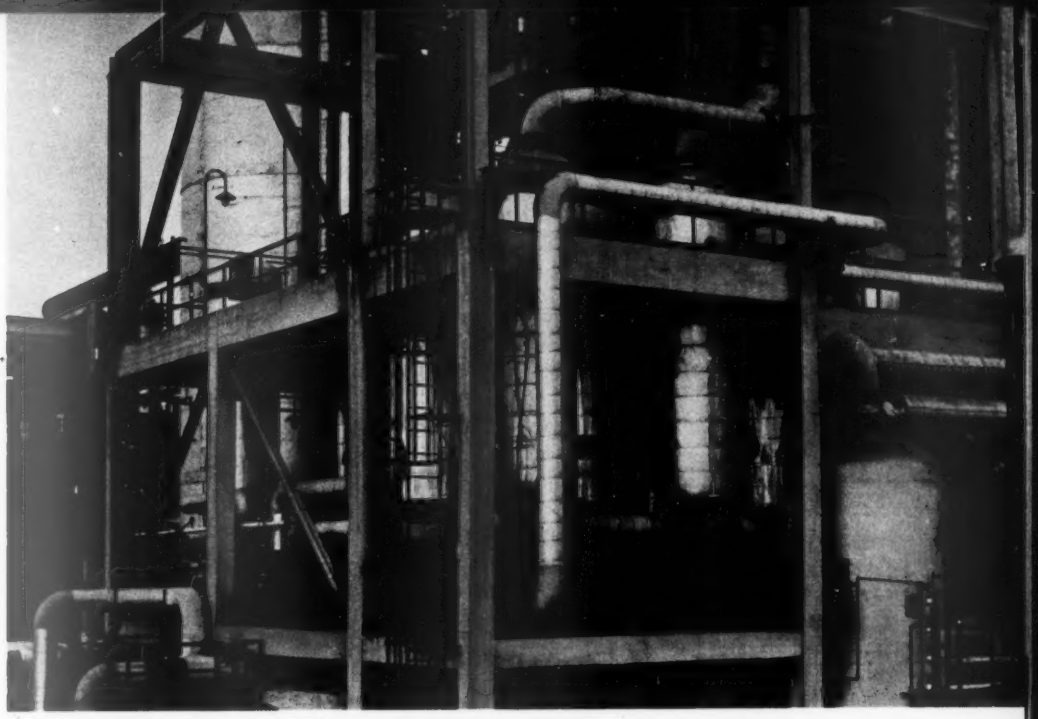
• **TANKHIDE also helps keep tank maintenance costs low,** and gives greater protection against weather-wear and corrosion, because of its remarkable toughness and durability.

• **Information on these advantages is easy to get.** Just write, wire or phone Pittsburgh Plate Glass Company,. Industrial Finishes, 1 Gateway Center, Pittsburgh 22, Pa.

PPG®

PITTSBURGH INDUSTRIAL FINISHES

PITTSBURGH PLATE GLASS COMPANY



Another heat transfer problem solved by Wolverine Trufin® Type S/T

THE LOCATION..... Humble's Bayway Refinery, Linden, N.J.

THE SERVICE..... Gas oil feed for fluid catalytic cracking unit.

TUBE SIDE FLUID..... Cat fractionator slurry recycle.

THE EQUIPMENT..... Eight 48" I.D. shell and tube heat exchangers.

THE PROBLEM..... Increase heat duty in transferring heat between two process streams.

THE SOLUTION..... The heat exchangers were retubed with Wolverine Trufin Type S/T —the integrally finned heat exchanger tube. In this case the tubing specified was 19 fins to the inch low carbon steel.

THE RESULT..... Extended surface Wolverine Trufin Type S/T brought about the desired increase in heat duty—without any modification whatsoever to the existing exchangers.

THE REASON..... See explanation on reverse side of this page.

WOLVERINE TUBE
DIVISION OF
Calumet & Hecla, Inc.
DEPT. N, 17238 SOUTHFIELD RD., ALLEN PARK, MICH.
TUBEMANSHIP in Copper—Copper Alloys—Aluminum—Special Metals

PLANTS IN DETROIT, MICHIGAN AND DECATUR, ALABAMA
SALES OFFICES IN PRINCIPAL CITIES

How to shrink plant costs and boost plant production

Before you design new heat transfer equipment or retube old—get the Wolverine Trufin story—discover how this extended surface tube can help you *shrink* plant costs and *boost* plant production.

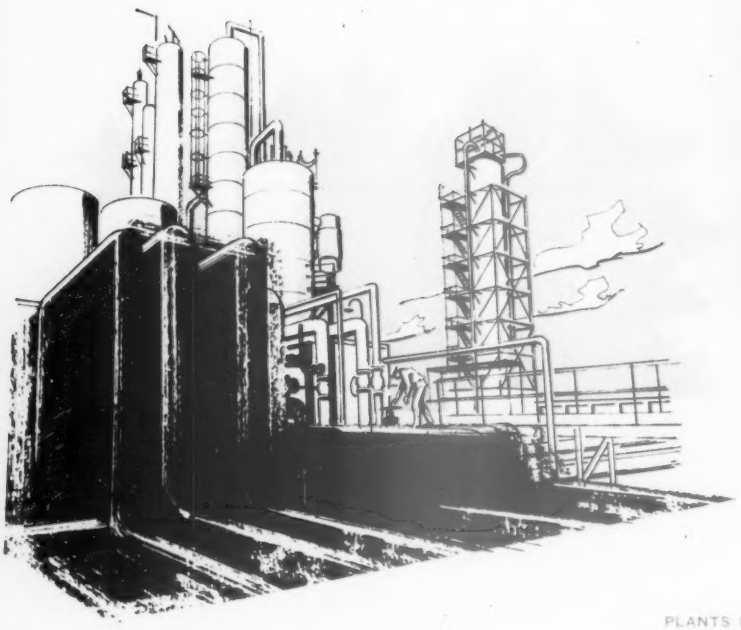
The explanation, of course, is found in Type S/T's integral fins which increase the outside heat transfer surface by as much as 2½ times over a length of bare tube of similar size.

As a result, more BTU's are transferred per foot of tube. Direct tube costs are reduced as are fabrication material and labor costs. In addition, because there is no increase in overall unit size and weight, Trufin-tubed units permit savings in valuable space and require less structural support.

These are some of the reasons why Wolverine Trufin Type S/T has been chosen for applications of the type described on the reverse side of this page. They are also the reason we suggest that you get the Trufin story —NOW! Just "Ask Your Wolverine Tube Salesman—HE KNOWS."

Write today for a free copy of the Trufin Comparison Costs Book.

WOLVERINE TUBE
DIVISION OF
Calumet & Hecla, Inc.
DEPT. N, 17238 SOUTHFIELD RD., ALLEN PARK, MICH.
TUBEMANSHIP in Copper—Copper Alloys—Aluminum—Special Metals



PLANTS IN DETROIT, MICHIGAN AND DECATUR, ALABAMA
SALES OFFICES IN PRINCIPAL CITIES

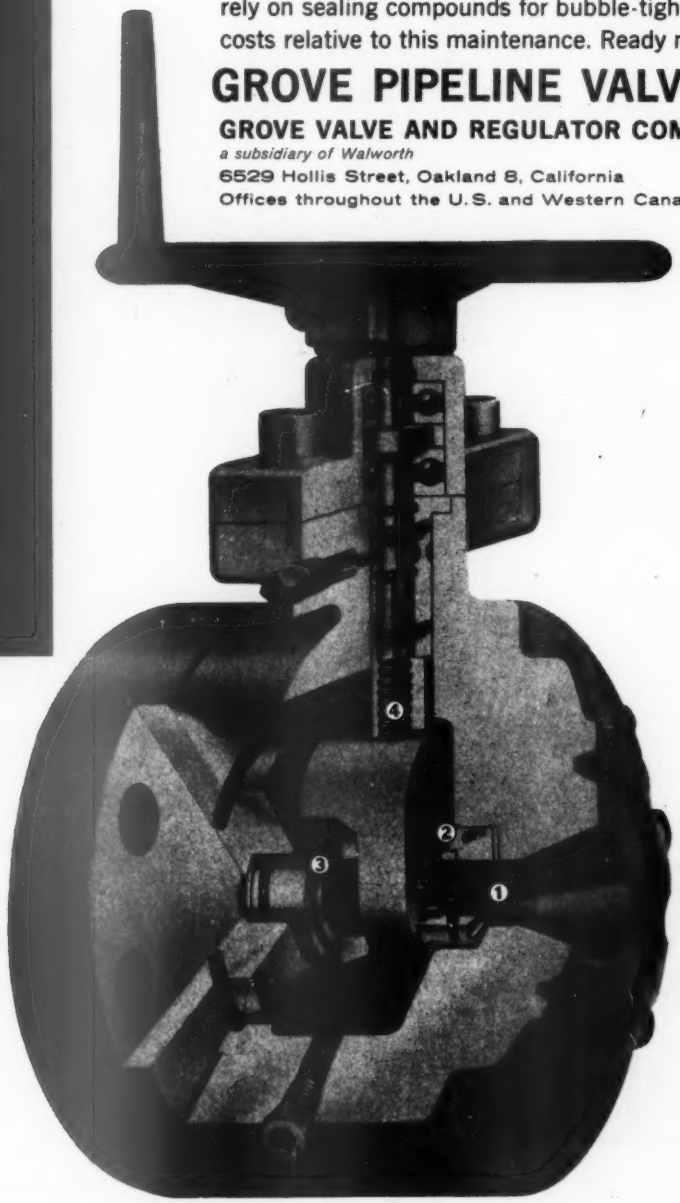
GROVE G-6 REGULAR PORT VALVE SIMPLE—COMPACT—VERSATILE

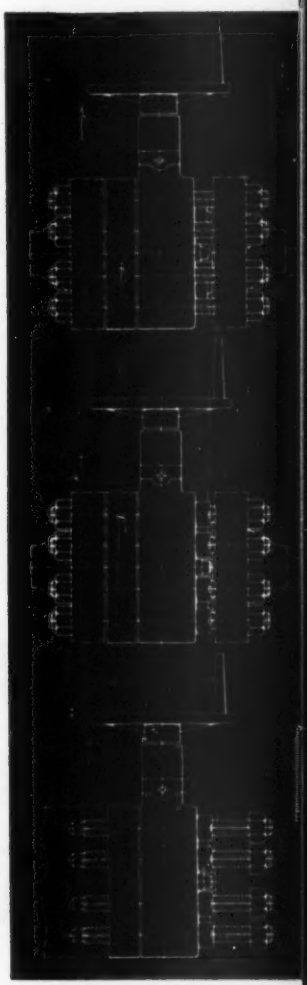
For Manifolds, Headers, General Pipeline service

Now the proven Grove Seal-"O"-Ring® design is ready in a compact regular port gate valve. Round opening (1) assures flow characteristics superior to plugs. Double-barrier seal gives positive metal-to-metal contact (2) backed up by protected o-rings (3) to keep gate clean, smooth for fast open/close. Non-rising stem (4) and "designed-in" compactness achieve overall height of only 14⅜". G-6 Regular Port gate valves, like all Grove valves, do not rely on sealing compounds for bubble-tight shut-off, thereby eliminating costs relative to this maintenance. Ready now in 2" ASA 900 and 1500.

GROVE PIPELINE VALVES

GROVE VALVE AND REGULATOR COMPANY
a subsidiary of Walworth
6529 Hollis Street, Oakland 8, California
Offices throughout the U.S. and Western Canada

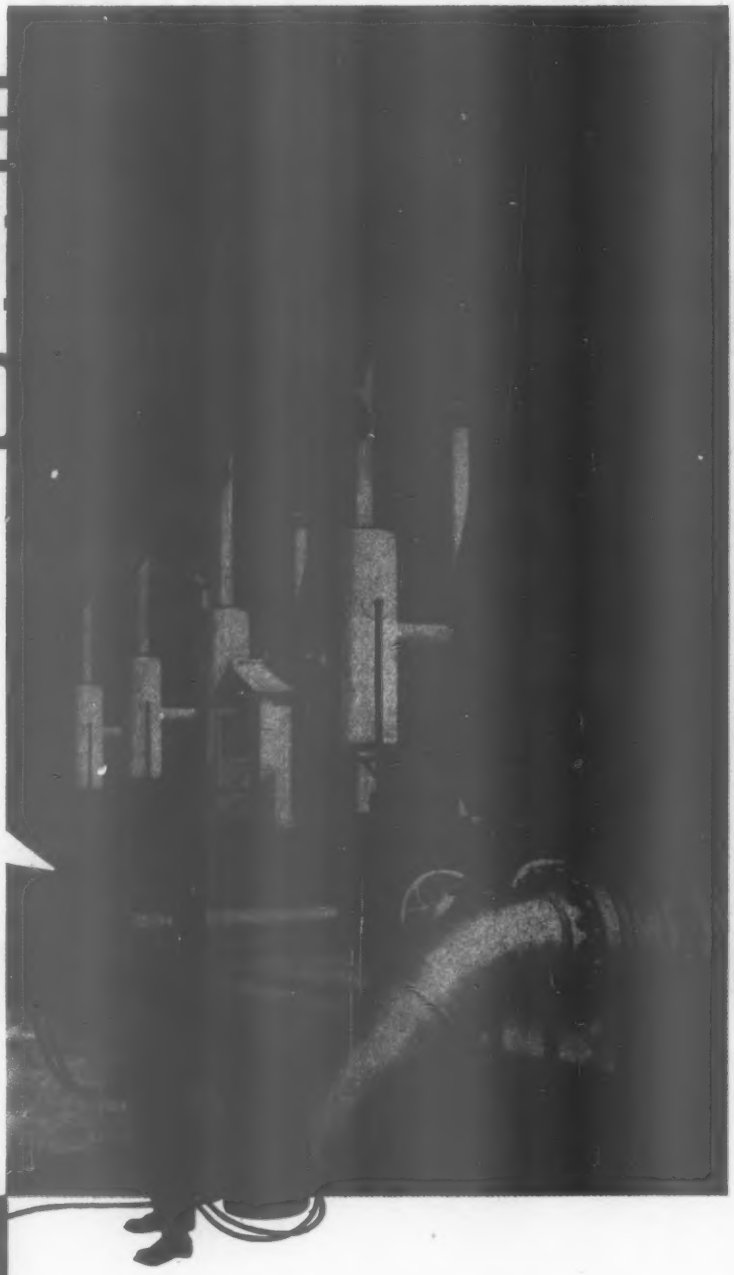




7181

New developments
help pumping stations fight rust, corrosion

HUMB
PROT
COAT



Off the press soon—the handbook of Humble Protective Coatings gives you new weapons to fight the high cost of corrosion.

Humble has *improved* compressor station coatings for stacks and other hot surfaces, for exposed or submerged pipes, for protecting pipes *internally*, for finish-painting (with added resistance to chemical attack), for masonry and metallic structures, and for precision parts or complete engines in storage.

These coatings are available now from Humble Bulk Plants. And they're all described in the new handbook. For your free copy, write Humble Oil & Refining Company, Houston, Texas.

HUMBLE

America's Leading ENergy COmpany

The "OILWELL" string...

PRODUCTS
SERVICES

STORES

When you buy from "Oilwell", you buy much more than a piece of equipment. You buy a function. You buy a means for drilling for oil or gas—or producing, transporting or processing it. With our products come services that make your job easier, your operation more profitable. Behind our products are services that work continually for higher quality, better design, and the assurance that when you buy from "Oilwell" you get the best in machinery and equipment. Stores and sales offices at over 100 points serving oil and gas operations in the United States and Canada round out the "Oilwell" string.

The "Oilwell" string even stretches to foreign lands where we provide representation in all free world oil and gas producing areas.

Turn the page for details about how the "Oilwell" string of products, services and stores assures you the most dependable source of supply in the petroleum industry.

USS **Oil Well Supply**
Division of
United States Steel

The "OILWELL" string...

PRODUCTS SERVICES STORES

99 years after the yellow dog

Not long after Col. Drake drilled his well, Oil Well Supply was in business and one of our earliest products was this "yellow dog," used for illumination. You can't buy a "yellow dog" from us today, but you *can* buy everything you need for the drilling, producing, refining and transporting of petroleum products . . . everything from a complete drilling rig to a handful of nails.

"Oilwell"-designed, -developed, and -field-tested machinery and equipment includes complete drilling rigs, surface and subsurface pumping equipment, reciprocating and centrifugal pumps, engines and compressors.

Distinct advantages to the user come from the fact that much of what we offer has been conceived and manufactured for the petroleum industry's specific needs.

In addition, "Oilwell" distributes the best of well-head equipment—valves and fittings—and all of the essential general running supplies, including USS National Tube pipe and USS Tiger Brand wire rope.

This wide range of own-make and selected vendor equipment, which we carry in stock, enables us to provide for our customers' needs whatever and wherever they may be.

USS and "Oilwell" are registered trademarks

No hole but pay every day

This installation works overtime just about every day, and the "pay" it produces ends up in your pocket. It's an "Oilwell" test center where we simulate actual drilling and waterflood pumping conditions to assure the dependability of "Oilwell" Pumps and Parts. Conditions can be varied from light loads to excessive overloads, and we can duplicate the roughest service you'll ever encounter. Complete instrumentation measures and records wear and performance of slush pump and plunger pump fluid end parts; we test everything about a pump, even the V-belts, gaskets, packing and oilers. From the data we collect come new designs, improved products and, ultimately, the kind of reliable performance that lowers *your* operating costs. Extensive testing is only one of many "Oilwell" services, which include research, application, installation, and maintenance.

One-stop shopping

Suppose your want list read like this: one pumping unit—one gas engine—one polished rod—one 4″ plug valve—two safety hats—one 24″ pipe wrench—and a 10 lb. box of rags. Where do you suppose you could get it all—all at once? At your nearest "Oilwell" store, of course. We're in business to give you quality products when and where you want them. Whatever your need, you'll find that when you get it from an "Oilwell" store. it will be of the best quality and priced right. And you won't have to go far because "Oilwell" stores are located for the convenience of our customers. That's why we say—Wherever there's oil—there's "Oilwell".

USS TRADEMARK

Oil Well Supply Division of United States Steel

Executive and Export Offices: Dallas, Texas

LINK-BELT SPHERICAL ROLLER BEARINGS:

measure these design values in terms of your applications

LINK-BELT SPHERICAL ROLLER BEARING PILLOW BLOCKS

Made with sturdy gray iron or super-rugged cast-steel housings. Adapter mounting types for shafts from 1 7/16" to 10 1/2". and direct-shaft mounting types for shafts from 1.7717" to 11.0236". Choice of rugged steel, multi-labyrinth or Dacron-contact seals.

GREATER CAPACITY!

The reason? *More rollers, larger rollers!* Bearing capacity depends primarily on effective roller Length, roller Diameter and Number of rollers (L x D x N). And Link-Belt offers the *largest effective roller complement* for all sizes of spherical roller bearings . . . rated according to accepted formulas of the Anti-Friction Bearing Manufacturers Association. This increase in LDN values provides extremely high capacity . . . and in users' evaluation, it adds up to far longer bearing life.

GREATER DURABILITY!

With balanced proportion design, Link-Belt spherical roller bearings possess durability characteristics that exceed the bearing industry's exacting requirements. Optimum balance of rollers, inner and outer rings must be obtained for increased bearing capacity . . . yet overall bearing dimensions must conform to an established international standard boundary plan.

Wrap-around, completely contoured retainers also contribute to durability through positive roller guidance and spacing. Precision-machined of centrifugally cast bronze, these husky retainers are far stronger than stampings or sand castings.

GREATER PRECISION!

Link-Belt spherical roller bearings are made in the world's most modern bearing plant . . . with the most-advanced tools and techniques known to industry. A rigid quality control program leaves *nothing* to chance. Each Link-Belt bearing is subjected to *758 actual inspections*. Microsmoothness and precision are continuously scrutinized by automatic machines. Result: these bearings have been specified by leading manufacturers of cranes, shovels, graders, vibrating screens, and steel mill, paper mill and foundry equipment . . . and for high-precision applications such as embossing rolls, printing presses and torque converters.

SEE BOOK 2760 for further precision, durability and high-capacity features. Contact your nearest Link-Belt office or authorized stock-carrying distributor. Look under BEARINGS in the Yellow Pages of your phone book.

LINK-BELT

SELF-ALIGNING BALL AND ROLLER BEARINGS

LINK-BELT COMPANY: Indianapolis 6, Houston 1, Dallas 26, Odessa, Tex., New Orleans 16, Shreveport, La., Los Angeles 22 (Montebello), Scarboro (Toronto 13); Export Office, New York 7. Distributors in All Fields. 15,603

SERVICE BEYOND THE SALE

WHAT IT IS AND WHAT IT MEANS TO USERS OF OIL FIELD EQUIPMENT

How do *you* measure the value of the service that an equipment manufacturer renders to the industry in which he operates? First by the importance and quality of his product. Secondly, by the scope and importance of his *beyond-the-sale* contributions to the industry. Keeping these yardsticks in mind, consider Gaso's service record:

FOR 46 YEARS WE HAVE

—worked to the single goal of improving the efficiency and lowering the cost of oil-industry pumping operations

—kept pace with changing oil-industry pumping needs and developed types and sizes to meet them

—pioneered in giving the oil industry the benefit of engineering and metallurgical advances in pump design

—maintained a staff of fully qualified pump engineers, ready always to assist in the solution of oil-industry pumping problems

—provided immediate parts service for all standard models in current use (including those placed in service 25 or more years ago)

—brought Gaso service and Gaso parts to the doorstep of users through carefully selected and thoroughly trained distributors located in all sections of the oil country

In a word: Gaso has for nearly half a century followed a policy of *earning* the place it occupies in the oil industry by providing not just pumps but a pumping *service* that starts with soundly designed products and extends throughout the long life of the unit.

It's a fact to keep in mind when choosing a source of supply.

Trademark of dependable, long-life, low-maintenance pumps used worldwide in pipeline, water flood and many other oil-industry applications.

DISTRIBUTORS

Farmington, N. M.—Gaso Pump & Burner Mfg. Co.

Shreveport, La., Odessa, Texas, Brookhaven and Tinsley, Miss.—W. L. Somner Company

Houston, Texas—Texas Pump & Compressor Company

Wichita Falls, Texas—Pump Engineering Co.

Evansville, Indiana—Hague Equipment Co., Inc.

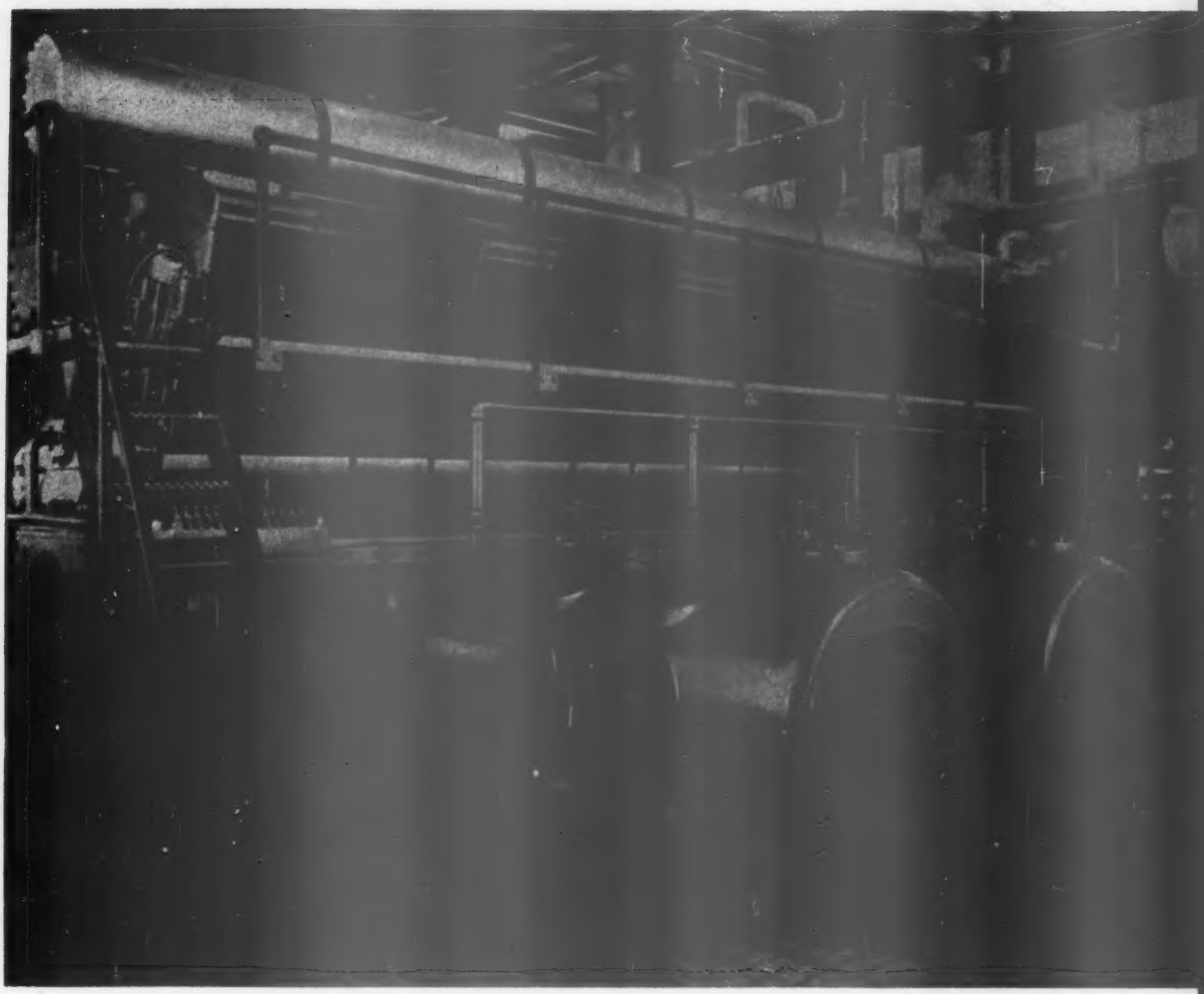
Long Beach and Bakersfield, Calif.—Power Pumps, Inc.

Casper, Wyoming—Lufkin Foundry & Machine Co.

Jackson, Mich.—Midway Supply Co.

Edmonton, Alberta—Lufkin Machine Co., Ltd.

GASO PUMP & BURNER MFG. CO. First and Lansing Sts., Tulsa, Okla.
Export Office: 2712 Empire State Bldg., New York, N. Y.



ENGINE EFFICIENCY

KVT

GAS-ENGINE COMPRESSORS

setting a new record in fuel economy for gas-engine compressors...

6300 btu/bhp/hr!

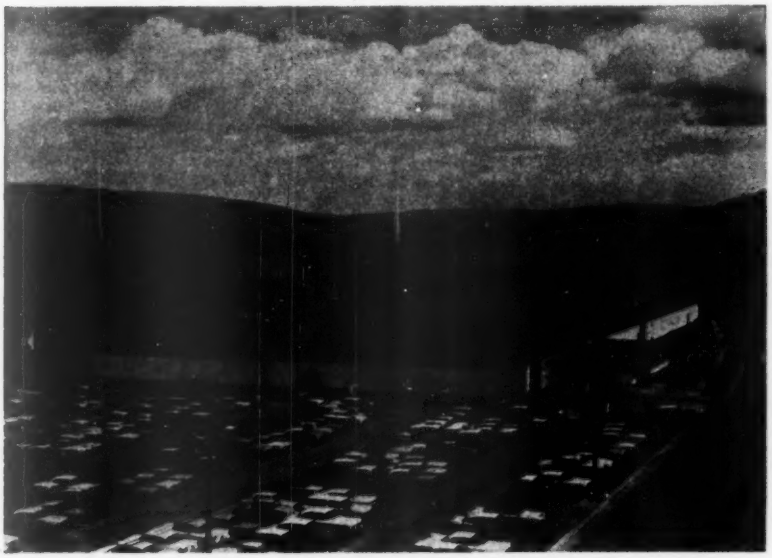
From Ingersoll-Rand's modern compressor plant at Painted Post, N.Y., comes a completely-new line of heavy-duty gas-engine compressors and power units in the 2000-4500-hp class. These powerful 4-cycle V-angle units offer a new high in fuel economy and unmatched flexibility for big-engine jobs on pipelines and in process plants.

The KVT, a completely new design, offers the lowest fuel consumption ever available in an engine-compressor. Using a high-level constant-pressure turbocharging system, it will run continuously at full speed and load with a fuel input of only 6300 btu/bhp/hr!

Also available is the new KVH, similar in size and construction but using a pulse system of low-level turbocharging which results in greater horsepower at a fuel rate of 6900 btu/bhp/hr.

THE WORLD'S MOST EFFICIENT GAS-ENGINE COMPRESSOR...

The first of the new KVT line, this 3000-hp unit with 5 compressor cylinders and 12 power cylinders has been in successful operation in a Louisiana gas pipeline station since December, 1959. More units are now installed on major pipelines in other parts of the U.S.



...FROM THE WORLD'S LARGEST COMPRESSOR FACTORY

Painted Post, N.Y.— the world's largest facility for the manufacture of compressors and engines, newly-expanded with the most modern equipment and skilled personnel.

in the large economy size!

At the compressor end, the KVT and KVH offer additional advantages: (1) new pipeline cylinder design with bottom intake and discharge connections permits simpler, neater, sturdier installations; (2) cylinders may be placed on both sides of the frame for greater flexibility on process jobs; (3) I-R Channel Valves are unmatched for efficiency and long life.

PKVT and PKVH gas engines, in corresponding sizes, offer efficiency and economy for all prime mover jobs. Where both engines and engine-compressors are used, they give the added advantage of standardized engine and running-gear components for lower inventories and quicker service.

Whether your needs are best met by the unmatched fuel economy of the KVT or the higher power of the KVH, you will find in these revolutionary new units the same service-proved dependability which has characterized Ingersoll-Rand 4-cycle, V-angle engine-compressors from 120 to 2000 hp for years. Your I-R representative is ready to give you more information.

Ingersoll-Rand

237A6 11 Broadway, New York 4, N.Y.

The World's Most Comprehensive Compressor Experience

They Say—

Champlin's discovery

Dear Sir:

The article "Pool May Straddle Border" on Page 42 of the June 5 issue continues the erroneous idea in many persons' minds that the Workman field was discovered by Kissinger Petroleum Co.

The Workman field was discovered by the Champlin Elmore, 3-23-1-32w1, and there were several additional wells completed in the field before Kissinger drilled his first well. The actual discovery well was shown as a field well on the Workman field map as published by the Journal.

R. W. Mallory
Champlin Oil & Refining Co.
Calgary

There's already one

Dear Sir:

May I refer you to page 42 of your June 5 issue where one of your writers thinks "The United States and Canada may have a first international oil field" in Saskatchewan and North Dakota. The writer must have forgotten Red Coulee where in Alberta oil was found in September 1929, close to the Montana border, and the major part of the field proved to be in Montana.

The discovery well was located by Dr. T. B. Williams, who found oil on the first try. He had been sent out by a small Calgary-based independent into the blue to hunt for a suitable structure and he worked entirely by surface geology. He is still living, retired, in Victoria, B. C.

Pardon me for attempting to find the slip showing, but another generation of writers has grown up since 1929.

Floyd K. Beach
Canadian Oil and
Gas Industries

. . . And two more to boot

Dear Sir:

The opening sentence of your article on page 42 in the June 5 issue ("Pool May Straddle Border")

The OIL AND GAS JOURNAL

TULSA OFFICE
211 South Cheyenne Avenue
Box 1260
Phone LUther 4-4411

George H. Weber ..... Editor
Henry D. Ralph .. Chief Editorial Writer
Ted A. Armstrong ..... News Editor
Gerald L. Farrar .... Engineering Editor
Frank J. Gardner .... Exploration Editor
Paul Reed ..... Pipeline Editor
W. L. Nelson ..... Technical Editor
Lynn M. Nichols .... Presentation Editor
John C. Casper ..... Economics Editor
W. B. Bleakley ..... Production Editor
W. A. Bachman ..... Marketing Editor
Neil Williams ..... Associate Editor
John C. McCaslin .... Geological Editor
Peter B. Bike ..... Geophysical Editor
H. S. Pylant, Petrochem. & Gas-Process. Editor
Jo Jeanne Speaker ..... Staff Artist

John P. O'Donnell .. Asst. Pipeline Editor
R. B. Tuttle ..... Equipment Editor
C. Dudley Johnston ..... Art Director
Robert B. Bizal ..... Editorial Research
Merle F. Blakely ..... District Editor
Sara Duncan ..... District Editor
Kenneth W. Brooks ..... District Editor
Norman K. Baxter ..... District Editor
Edward A. Martin ..... District Editor
Max L. Batcheldor .... Asst. Pres. Editor
Helen Brown ..... Editorial Assistant
Alice Burt ..... Editorial Assistant
Aileen Cantrell ..... Editorial Assistant
Margaret Higgs ..... Editorial Assistant
Marilyn Chance ..... Editorial Assistant

NEW YORK OFFICE
500 Fifth Avenue
Phone LOngacre 4-1910

D. H. Stormont ..... Refining Editor
Paul Swain ..... International Editor
Gene T. Kinney ..... East Coast Editor
Ray G. Gibson ..... District Editor

HOUSTON OFFICE
802 American Investors Building
Phone CApitol 4-7726

Ed McGhee ..... Drilling Editor
Howard M. Wilson ..... District Editor
H. C. Bozeman Gulf Coast Refining Editor

DALLAS OFFICE
1238 Mercantile Bank Building
Phone Riverside 8-5701

Robert J. Enright ..... District Editor

LOS ANGELES OFFICE
650 South Grand Avenue
Phone MAdison 2-0722

Carl J. Lawrence .... West Coast Editor

WASHINGTON OFFICE
621 Albee Building
Phone District 7-1710

Clyde La Motte ..... Washington Editor

BUSINESS STAFF

P. C. Lavinger ..... President

S. H. Rourke .. Executive Vice President
Mitchell Tucker . Vice Pres. and Adv. Mgr.
Kenneth B. Barnes .... Vice Pres., Eastern Hemisphere Operations
Hanson B. Pigman . Vice Pres., Circulation
L. John Ford ..... Mgr. Industry Census
J. Parker Holland ... Ass't. to V.P., Adv.
Paul McBride ..... Production Manager

ADVERTISING STAFF

TULSA OFFICE
211 South Cheyenne Avenue
Phone LUther 4-4411

John D. Reilly .. Mid-Continent Manager
Roy E. Finley ..... District Manager
Philip C. Lavinger, Jr. .. Representative
William H. Dickey .. Classified Adv. Mgr.

NEW YORK OFFICE
500 Fifth Avenue
Phone LOngacre 4-1910

E. S. Klappenbach .... Eastern Manager
Harry B. Bullen ..... District Manager

PHILADELPHIA OFFICE
1509 Land Title Building
Broad and Chestnut Streets
Phone LOcust 3-0118

John W. Meany, Jr. .... District Manager

DALLAS OFFICE
1238 Mercantile Building
Phone Riverside 8-5701

Pren G. Hollingsworth .. District Manager

HOUSTON OFFICE
802 American Investors Building
Phone CApitol 4-7726

John M. Spears .... Gulf Coast Manager

LOS ANGELES OFFICE
650 South Grand Avenue
Phone MAdison 2-0722

George O. Ruppert .... District Manager

CHICAGO OFFICE
105 West Madison Street
Phone CEntral 6-2537

David T. Kenney ..... District Manager
Karel Wegkamp ..... District Manager

DETROIT OFFICE
204 Washington Square Building
Royal Oak, Mich.
Phone Lincoln 7-9455

John D. Yoder ..... District Manager

PITTSBURGH OFFICE
Law & Finance Building, 429 Fourth Avenue
Room 1050
Phone GRant 1-5847

Ernest S. Holzworth .... District Manager

ENGLAND
67/68 Jermyn Street, St. James's,
London S.W. 1. Phone TRAfalgar 6318

Max Holsinger .... Director International Sales Operations
A. T. Chapman-Purchas .. Group Manager

11 Tewit Well Road, Harrogate, Yorkshire
Philip King ..... Northern Manager

WEST GERMANY
Düsseldorf Huttenstrasse 17, am
Phone 10493
Ing. Georg Wilhelm Rohde—Group Mgr.

Subscription rates to the petroleum industry United States and foreign, 1 year, $6.00; 2 years, $9.00; 3 years, $12.00. Single copies $1.00. Back copies when over a year old, $2.00.

Member
Audit Bureau of Circulations
Associated Business Publications

reads "It looks as if the United States and Canada may have their first 'international' oil field."

May I point out that Union Oil Co. of California completed their 1 Oslanski well in LSD4, 1-1-17w4 as a pumping oil producer in the Moulton sand on June 22, 1954. This well was an extension of the North Darling pool in northern Montana and is the only producing well completed in this field north of the border.

In December, 1957, 1 Dernick-Guyer-Vallat-Reagan in LSD1, 6-1-19w4, was completed as a Mississippian oil well at a depth of 3,580 ft., with a pumping-initial potential of 60 bbl. daily. Union Oil has a 50% interest in this well, which is an extension of the Reagan oil field in northern Montana. In 1960, two other wells, 2-6 Reagan and 7-6 Reagan, were completed as pumping oil wells from the same Mississippian formation.

Therefore, if the South Carievale field extends into the United States it would be the third, not the first, to straddle the United States-Canada border.

Eric J. Connor
Division Engineer
Union Oil Co. of California
Calgary.

Forgotten: one author

Dear Sir:

The article you published under my name in the May 22 issue entitled "Statistics Solve an Inspection Problem" (p. 92) should have shown Mr. R. P. Buhrow, chief inspector of Sohio's Cleveland refinery, as co-author. I am sure this was indicated on the draft which you received.

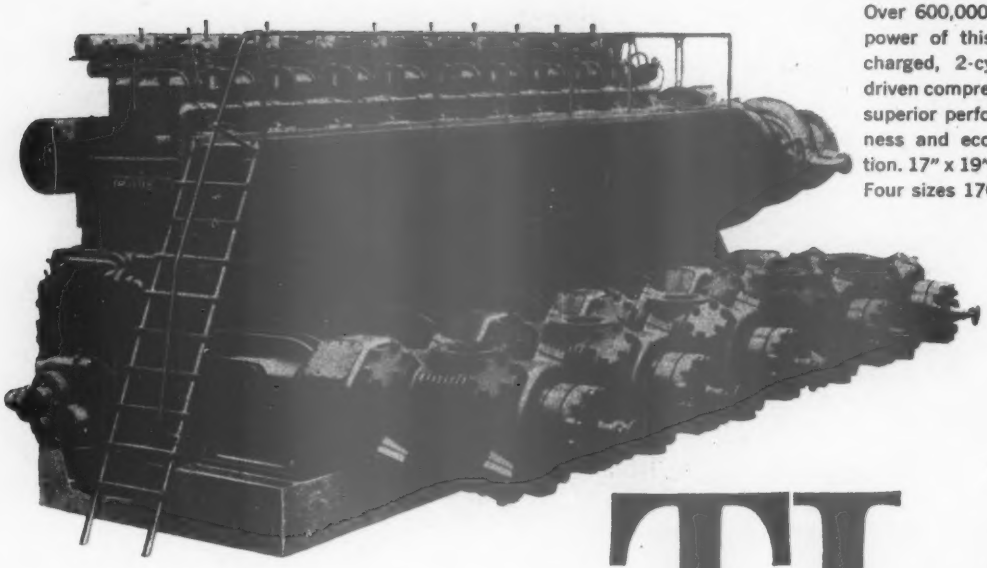
W. P. Shontz
Inspection Consultant
Standard Oil Co. (Ohio)
Cleveland.

Our apologies to authors Shontz and Buhrow. Mr. Buhrow should have received credit as co-author of the May 22 article.—Ed.

Controls and competition

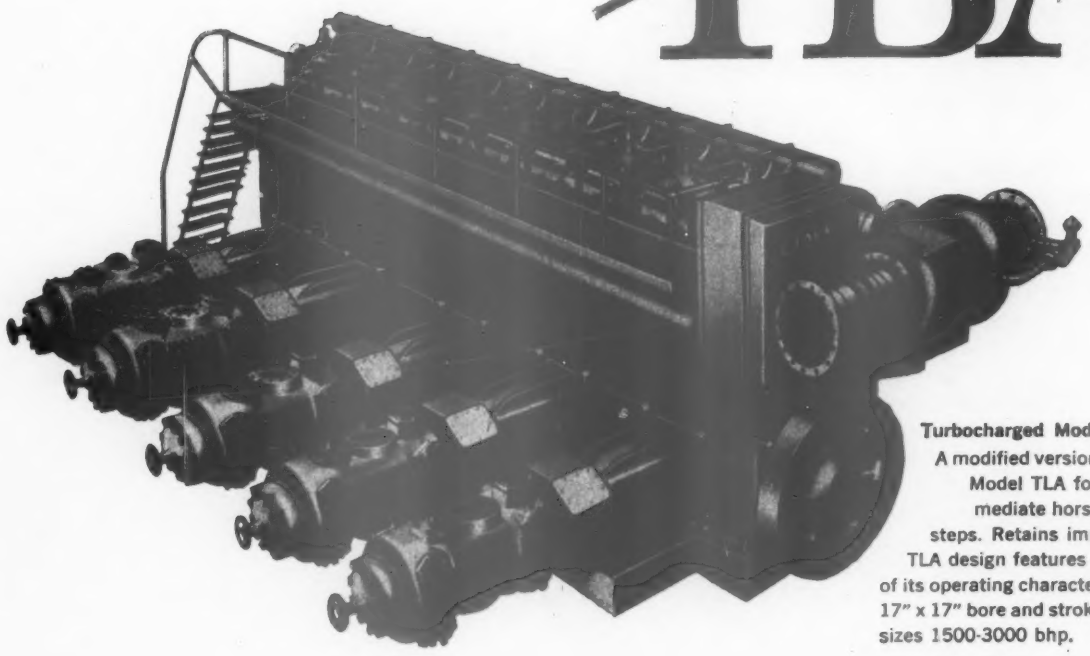
"Controls tend to destroy the ability to compete by creating inflexible situations. Given the proper climate, industry has demonstrated

LOOK INSIDE
AND YOU WILL
SEE WHY THE
HARBISON-FISCHER
TEXAS STRIPPER
IS THE BEST PUMP
IN THE OIL PATCH
FOR SANDY, SHALLOW
STRIPPER WELLS . . .
This pump won't sand up when the well is shut down because an outer jacket tube (cut back, above) that extends the full length of the pump barrel completely shields the plunger discharge ports from sand that settles out of the fluid column. In operation, as fluid is produced it travels in the annulus between the two tubes and is discharged near the hold-down at the bottom of the pump. This also tends to keep float sand and well trash agitated and suspended in the oil when the well is pumping.
Texas Stripper Rod Pumps are available in 2" and 2½" tubing sizes in a wide range of plunger and barrel tube combinations for various well conditions. Ask your store, or one of our factory representatives in any major producing area, for illustrated literature. There's no obligation, of course. HARBISON-FISCHER.
HF



Popular Model TLA
Over 600,000 installed horsepower of this famous turbocharged, 2-cycle gas-engine-driven compressor testify to its superior performance, ruggedness and economy of operation. 17" x 19" bore and stroke. Four sizes 1700-3400 bhp.

the CLARK TLA TBA



Turbocharged Model TBA
A modified version of the Model TLA for intermediate horsepower steps. Retains important TLA design features and all of its operating characteristics. 17" x 17" bore and stroke. Four sizes 1500-3000 bhp.

Working together in allied industries . . .

ROOTS® CONNERSVILLE — *Blowers, Compressors, Gas Pumps, Rootsmeters, Vacuum Blowers*

PODBIELNIAK — *Centrifugal Contactors, Distillation Apparatus, Instrumentation*

Now you can name the horsepower—from 1500 to 3400 bhp—and name Clark with confidence. Clark has the compressor to fit your needs *exactly!*

With the addition of the TBA Series (a modified version of the time-tested Model TLA 2-Cycle, Gas-Engine-Driven Compressor), Clark now offers eight closely graduated sizes in this important horsepower range for pipeline and process applications.

The TBA is carefully matched to the TLA, giving you not only the best horsepower choice, but also a machine you can trust. Here's how it's done:

Same Heavy Duty Construction—The TBA incorporates the lower crankcase with thru-bolts, crankshaft, power pistons, compressor cylinders, aluminum bearings and running gear of the TLA—all thoroughly proved in exacting field duty. Both machines are specifically designed to handle the high power delivered by turbocharging.

Same High Efficiency Turbocharging System—The Clark designed, constant pressure turbocharger provides a flexible supply of combustion air that varies in proportion to the load placed on the engine. Thus the fuel-air ratio is inherently correct over the entire operating range.

Same Operating Flexibility—The turbocharger system coupled with a new automatic ignition timing control makes the TBA and the TLA ideally suited for variable speed, variable load applications. The fuel consumption curve remains essentially flat over a wide range . . . from reduced speeds at constant or variable torque all the way up to substantial emergency overloads at rated speed.

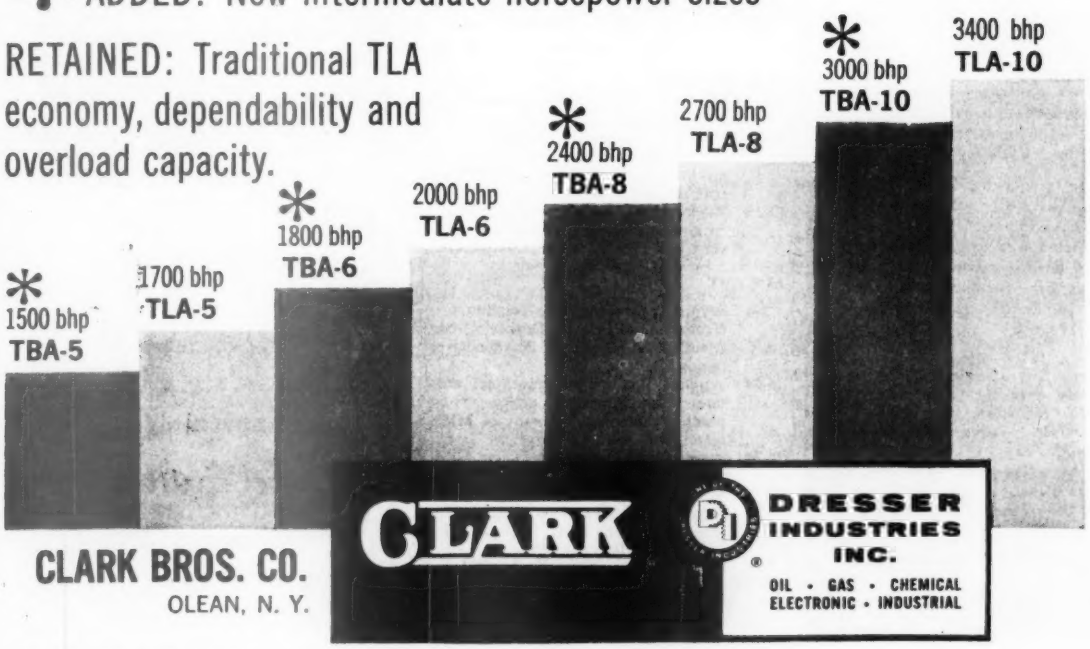
What's different, then? The stroke on the TBA has been shortened from 19" to 17", the external configuration of the power cylinders has been modified, and the ratings have been changed in accordance with the new stroke length. The TBA is built in five, six, eight and ten power cylinder models rated at 1500, 1800, 2400 and 3000 bhp respectively.

More facts are yours for the asking. Write for new Clark TBA Bulletin 206, and new TLA Bulletin 225.

Line is IN STEP with your pipeline or process requirements

*ADDED: New intermediate horsepower sizes

RETAINED: Traditional TLA economy, dependability and overload capacity.



CLARK BROS. CO.
OLEAN, N. Y.

CLARK

DRESSER INDUSTRIES INC.
OIL • GAS • CHEMICAL
ELECTRONIC • INDUSTRIAL

that it can work in the national interest."

E. D. Loughney, president, British American Oil Co., in a speech to company shareholders.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR OF EVENTS

JUNE

25-30	American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.
26-27	Michigan Gas Association, annual meeting, Grand Hotel, Mackinac Island, Mich.
26-July 7	Massachusetts Institute of Technology, summer program on dynamics and control of chemical engineering processes, Cambridge, Mass.
28-30	International Gas Conference, Stockholm, Sweden.
28-30	Instrument Society of America, American Institute of Chemical Engineers, American Institute of Electrical Engineers, American Society of Mechanical Engineers, and Institute of Radio Engineers, joint automatic control conference, Boulder, Colo.
30	Southern Gas Association, round-table conference on pipeline operations and maintenance, Dinkler-Tutwiler Hotel, Birmingham, Ala.

JULY

4-7	National Society of Professional Engineers, twenty-seventh annual meeting, Olympic Hotel, Seattle.
6-8	International Oil Scouts Association, annual meeting, Roosevelt Hotel, New Orleans.
10-21	University of Michigan, summer course on underground storage of natural gas, Ann Arbor, Mich.
23-28	National Congress of Petroleum Retailers, annual session, Cosmopolitan Hotel, Denver.
26-28	American Petroleum Institute, Division of Production, eastern district meeting, The Greenbrier, White Sulphur Springs, W. Va.
27-29	Rocky Mountain Mineral Law Foundation, seventh annual institute, University of New Mexico, Albuquerque.

AUGUST

2-4	Wyoming Geological Association, sixteenth annual field conference, Green River, Wind River, and Powder River basins.
20-24	Asphalt Institute, international conference on structural design of asphalt pavements, University of Michigan, Ann Arbor.
28-30	Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, W. Va.
28-Sept. 1	American Society of Mechanical Engineers, international heat transfer conference, Boulder, Colo.

SEPTEMBER

5-8	American Chemical Society, Chicago section, eleventh national chemical

MARTIN RUBBER & DUCK RINGS give excellent life in dirty abrasive fluids . . . high or low gravity . . . much or little water . . . shallow or deep wells. They last for years in the easier pumping wells. Replacement rings cost comparatively little.

MARTIN PLUNGER BODIES, precision grooved, drilled and threaded (no underneath fluid passage), usually last for years. Tube or barrel costs are often cut in half.

The replaceable SYNTHETIC RUBBER GUIDES in MARTIN CAGES last longer than any metal, and the cushioning of the ball increases your ball & seat life. Results are often truly amazing. (Patent No. 2,591,174)

Write for our new catalog or see it in the Composite (24th Edition). All products sold thru supply companies.

JOHN R. MARTIN
Manufacturer
[illegible] TULSA, OKLAHOMA

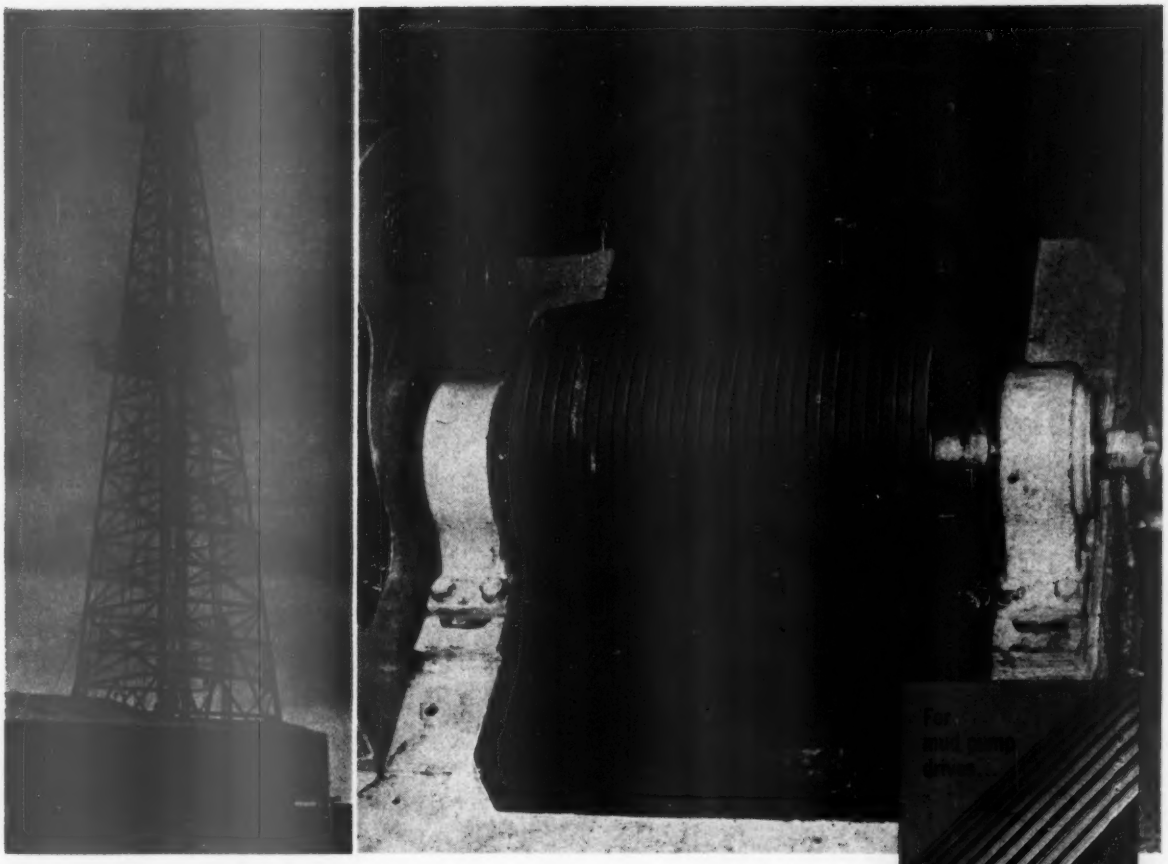
CORROSION INHIBITORS
EFFECTIVE PROTECTION at LESS COST!
AT SUPPLY STORES

BrakeSol
REG. U.S. PAT. OFF. INC.
P. O. BOX 9506
OKLAHOMA CITY, OKLAHOMA

Amot Model 4017
SPEED ACTUATED VALVE

Single or dual speed function for indicating a running engine, as overspeed safety device, or both. Also for automatic starting systems. Employs fail safe and other features not found in any other control. Available with horizontal or vertical mounting, direct drive or speed increaser, or with electric snap switch if desired. Valves are independently adjustable, reset automatically, manually, or pneumatically. Write for details.

Amot controls
CORPORATION
417A FIRST ST. • RICHMOND, CALIF., U.S.A.



Gates Super HC V-Belt Drives save you up to 50% in space, 20% in weight and cost

Because of basic changes in V-belt shape and construction, Gates Super HC High Capacity V-Belts can handle up to 3 times the horsepower of conventional V-belts in the same space. Or the Gates Drive can transmit the same power as conventional V-belts in ⅓ to ½ the space.

With this greater horsepower-carrying capacity, fewer Super HC V-Belts are needed . . . sheaves can be smaller and lighter in weight. This reduces your cost for a V-belt drive by as much as 20%. Drive weight is also reduced about 20%, lowering bearing loads, increasing bearing life. Guards and machine housings can be smaller and lighter in weight, reducing material costs, and making portable equipment more compact. Moreover, the Super HC Drive can operate at belt speeds up to 6,000 ft/min without dynamic balancing, often permitting use of lower cost, higher speed engines.

The local Gates Man serving your area is a drive design expert. Contact him for drive design aid and for complete technical information, by calling your nearby Gates-stocked supply house.

The Gates Rubber Company, Denver, Colorado

BP57

Gates

Building the future on 50 years of progress.

Gates Super HC V-Belt Drives

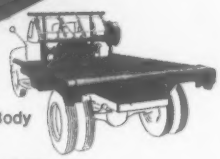
YOUR NEXT MOVE IS TO Leland's NEW WORKHORSES

TILT TRAILER

for easy, fast loading of tractors and other self-propelled vehicles. Designed for easy maneuverability on construction sites, oil leases and in-city work, this new Leland unit eliminates skid loading. It can easily be pulled by a regular truck with trailer hitches . . . no fifth-wheel is required.

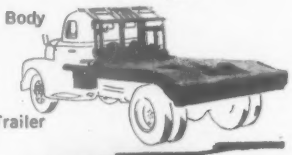
WELDING BODY

makes field welding jobs fast, simple. By mounting a gasoline powered welding machine on the famous "Packaged Unit" body Leland has produced a unit that is capable of handling the most difficult jobs in the field. This unit will quickly winch, tow or hoist the heaviest equipment into position for welding.



"Packaged Unit" Body

Fifth Wheel Body



Other Leland Truck Equipment

Low Boy Trailers

Pole Trailer

Fast service from Leland is the answer to your construction equipment problems. Leland provides complete parts and service on Thew-Lorain . . . Gardner-Denver . . . C-M-C . . . Blaw-Knox . . . Cedarapids . . . Cleveland Trenchers . . . Bros Road Equipment . . . Tulsa Winches.

Leland

EQUIPMENT COMPANY

[illegible] City . . . TULSA . . . [illegible], Texas

exposition, International Amphitheatre, Chicago.

7-8 Rocky Mountain Association of Geologists, field conference, Salida, Monarch, Ouray, Silverton, and Durango, Colo., areas.

7-9 Magic Plains Oil Exposition, Borger, Tex.

11-15 Instrument Society of America, fall instrument - automation conference and exhibit and sixteenth annual meeting, Biltmore Hotel and Memorial Sports Arena, Los Angeles.

12-13 American Gas Association, Southern Gas Association, annual accident prevention conference, Statler Hilton Hotel, Dallas.

13-15 Pacific Coast Gas Association, convention and annual meeting, Coronado Hotel, Coronado, Calif.

13-15 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, annual meeting, Roosevelt Hotel, New Orleans.

13-15 National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, N. J.

14 Natural Gasoline Association of America, Rocky Mountain regional meeting, Northern Hotel, Billings, Mont.

15-16 Kansas Geological Society, annual field conference, Mark Twain Hotel, Hannibal, Mo.

17-20 American Institute of Electrical Engineers, annual electrical conference of the petroleum industry, Jung Hotel, New Orleans.

18-19 Independent Natural Gas Association of America, annual meeting, Shamrock Hilton Hotel, Houston.

20-21 Western Petroleum Refiners Association, Rocky Mountain regional technical-industrial relations meeting, Henning Hotel, Casper, Wyo.

20-21 American Institute of Electrical Engineers, Institute of Radio Engineers, Instrument Society of America, industrial electronics symposium, Bradford Hotel, Boston.

24-27 American Institute of Chemical Engineers, national meeting, Lake Placid Club, Lake Placid, N. Y.

24-27 American Society of Mechanical Engineers, petroleum mechanical engineering conference, Muehlebach Hotel, Kansas City.

25-27 Texas Mid-Continent Oil and Gas Association, annual meeting, Texas Hotel, Fort Worth.

25-28 American Welding Society, fall meeting, Adolphus Hotel, Dallas.

OCTOBER

1-4 American Gas Association, annual convention, Dallas.

3-4 University of Kansas, ninth annual gas measurement institute, National Guard Armory, Liberal, Kans.

4-6 American Association of Oilwell Drilling Contractors, annual meeting, Rice Hotel, Houston.

4-6 American Society of Mechanical Engineers, process-industries conference, Shamrock-Hilton Hotel, Houston.

8-11 Society of Petroleum Engineers of AIME, annual fall meeting, Memorial Auditorium, Dallas.

11-12 Western Petroleum Refiners Association, waste disposal and stream pollution conference, Hotel Lassen, Wichita.

12-13 California Natural Gasoline Association, annual fall meeting, Lafayette Hotel, Long Beach, Calif.

15-17 National Association of Oil Equipment Jobbers, annual convention

PIONEERS IN EFFICIENT DESIGN

COBRA

IN MUD OR AIR

Reed Cobra bits are just one example of the outstanding economies made possible by Reed's continuing program of research and development. These bits are setting phenomenal records all over the oil country in both mud and air drilling. For example—

On a West Texas well, drilling with mud below 12,000 feet, four Reed Cobra bits drilled 2,289 feet in 404½ hours. On an offset well it took 37 tooth bits to drill 2,172 feet in 558 hours. On another West Texas well a Cobra bit set an air drilling record of 3,644 feet in 103 hours.

In Pennsylvania, drilling with air, it is routine for one Reed Cobra bit to complete the hole from surface casing to TD. In this area total footage per Cobra bit regularly exceeds 7,000 feet.

Drilling with mud in East Texas in the tough Travis Peak formation Cobra bits consistently get runs up to 250 feet. Drilling with gas in Mississippi 10 Cobra bits drilled 6,850 feet in 358½ hours. In the same vicinity more than 10 times this number of tooth bits were required to drill the same footage with mud.

There is a Reed man near you. Let him give you the full story on Reed Cobra bits and the Reed Quality Line—tool joints, drill dollars and rock bits.

PENNSYLVANIA — 1 COBRA BIT
8,352 FEET IN 134½ HOURS

WEST TEXAS — 1 COBRA BIT
3,644 FEET IN 103 HOURS

FOUR CORNERS — 1 COBRA BIT
4,102 FEET IN 133½ HOURS

MISSISSIPPI — 1 COBRA BIT
[illegible] FEET IN 51[illegible] HOURS

REED ROLLER BIT COMPANY

HUDSON EXPERIENCE IN COOLING TOWER REPAIR, REMODELING AND REPLACEMENT — ASSURES SPEED, SKILL, AND INTEGRITY

For instance the above pictured HUDSON induced draft tower, 36 feet long, was erected in the area and on the foundations formerly occupied by the mid sections of a 162 feet long deteriorated natural draft tower. Exposed-tube coolers in the base of the original tower were left in place, and cooled water from the new tower distributed over these coolers. The completed installation is shown below.

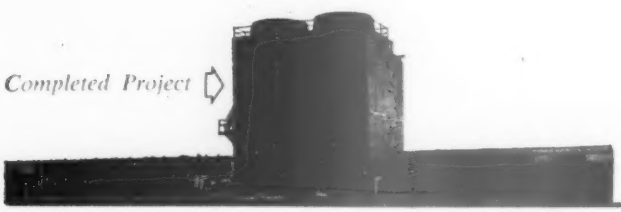
The work of dismantling, remodeling, and erection required 27 working days, and total shutdown time was less than 24 hours.

Although deterioration of the old tower necessitated its replacement, plant records show that increased revenue due to lower operating costs and greater product yield because of colder water, will give a *quick return of the investment.*

HUDSON maintains a cooling tower repair and replacement department staffed with experienced engineering and field personnel. Materials are stocked at HUDSON fabricating centers in California and Texas. If your cooling tower is *obsolete* or deteriorated avail yourself of HUDSON cooperation in developing the most economic replacement program.

In addition to water cooling towers HUDSON designs and manufactures SOLO-AIRE units (for cooling solely with air), and COMBIN-AIRE units (for cooling with combination of air and water). Only HUDSON is equipped to integrate these all-encompassing categories of equipment into cooling systems balanced to meet most economically specific conditions of climate, quantity and quality of water, and processing requirements.

Completed Project ⇨



HUDSON

ENGINEERING CORPORATION

BRAEBURN STATION • HOUSTON, TEXAS

OFFICES: 16033 Ventura Blvd. Encino, California • 122 East 42nd St. New York 17, N. Y. • 199 Bay Street Toronto, Ontario, Canada • 17 Stratton St. Piccadilly London W. 1, England • Corrientes 1115 Buenos Aires, Argen. • Rua Mexico 45 Rio de Janeiro, Brazil

and trade show, Mayflower Hotel, Washington.

15-18 American Petroleum Credit Association, annual conference, Shamrock-Hilton Hotel, Houston.

17-19 American Society of Mechanical Engineers, American Society of Lubricating Engineers, lubrication conference, Morrison Hotel, Chicago.

18-20 Rocky Mountain Oil and Gas Association, annual convention, Denver-Hilton Hotel, Denver.

18-21 American Association of Petroleum Geologists, Mid-Continent regional meeting, Amarillo, Tex.

24-25 Pennsylvania Grade Crude Oil Association and Pennsylvania State University Mineral Industries Experiment Station, technical conference on oil recovery by solvents, Pennsylvania State University campus, University Park.

24-27 National Association of Corrosion Engineers, south-central region conference and exhibition, Shamrock-Hilton Hotel, Houston.

25-26 Western Petroleum Refiners Association, annual question and answer session on refining technology, Rufus Garrett Hotel, El Dorado, Ark.

25-27 Gulf Coast Association of Geological Societies, annual meeting, Granada Hotel, San Antonio, Tex.

27 Natural Gasoline Association of America, southern regional meeting, Carlton Hotel, Tyler, Tex.

29-31 Independent Petroleum Association of America, annual meeting, Shamrock-Hilton Hotel, Houston.

29-Nov. 1 National Lubricating Grease Institute, annual meeting, Rice Hotel, Houston.

NOVEMBER

1-3 Southwest Federation of Geological Societies, annual meeting, Hilton Hotel, El Paso, Tex.

2-3 Society of Petroleum Engineers of AIME, annual California regional meeting, Hacienda Motel, Bakersfield, Calif.

2-4 Geological Society of America, annual meeting, Cincinnati, Ohio.

5-9 Society of Exploration Geophysicists, international meeting, Denver.

6-8 Chemical Institute of Canada, conference of the chemical engineering division, Royal York Hotel, Toronto.

9-10 Society of Automotive Engineers, national fuels and lubricants meeting, Shamrock-Hilton Hotel, Houston.

13-15 American Petroleum Institute, forty-first annual meeting, Conrad Hilton, Congress and Palmer House hotels, Chicago.

17 Natural Gasoline Association of America, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

26-Dec. 1 American Society of Mechanical Engineers, winter annual meeting, Statler-Hilton Hotel, New York City.

DECEMBER

3-6 American Institute of Chemical Engineers, annual meeting, New Yorker Hotel, New York City.

4-6 Interstate Oil Compact Commission, annual meeting, Denver Hilton Hotel, Denver.

5-6 Western Petroleum Refiners Association, computer conference for refiners, Hotel Tulsa, Tulsa.

JANUARY

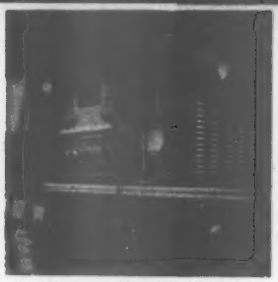
8-12 Society of Automotive Engineers, annual meeting, Cobo Hall, Detroit.

16-18 Kentucky Petroleum Marketers Association, annual meeting and convention, Brown Hotel, Louisville, Ky.

Which grade?
50%
73%
Key chemical selection in liquid caustic
A key chemical is the best buy. Case in point: liquid caustic. We offer it in two concentrations . . . 50% and 73%. Today, your best buy may be the 50% grade. If so, that's what we'll recommend—today. But if stepped-up use of caustic or changes in freight rates alter your economic position in the future—we'll recommend conversion. We never consider our first analysis final . . . and never stop working with you.
WYANDOTTE
CHEMICALS
MICHIGAN ALKALI DIVISION, WYANDOTTE, MICHIGAN

Upsetter

Flare & Crush Test



Continuous Non-Destructive Ultrasonic Test

Hydrostatic Tester

12 REASONS WHY

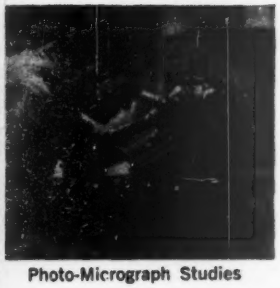
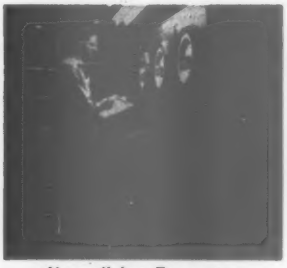


Photo-Micrograph Studies

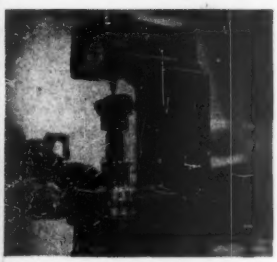


Normalizing Furnaces

200,000 lb. Full Section Tensile Tester

In-Plant Chemical Analysis

YOU GET BETTER PIPE



Rockwell Hardness Tester

Macro-Etching Studies

Quality Control During Run

Final Inspection

FROM TEX-TUBE

Most pipe mills are rarely expected to provide anything more than average product, good service, fair price. Tex-Tube believes two more steps are necessary: 1) Rigid, uncompromising quality control of the product line and 2) Continuous research toward development of new and improved products.

To that effort, Tex-Tube has inaugurated a Research and Development program calculated to match anything offered in the industry.

This Research and Development program at Tex-Tube has two very tangible benefits for you—

1. You'll get **better pipe**
2. You'll get new products to improve your own operation

The photographs here show just 12 of the quality control steps through which Tex-Tube pipe goes including our metallurgical laboratory, our chemical analyses, our in-line control check points.

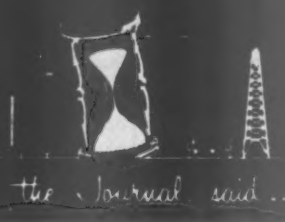
When you need pipe, specify Tex-Tube — and know that you get the best-**first.**

LITTLE MILL SERVICE/BIG MILL QUALITY

TEX TUBE

Pipe Manufacturers: High Tensile Lightwall Pipe/Oil Well Casing/Oil Well Tubing/Structural and Mechanical Tubing/Shot Hole Casing/Upsetting, Theading, Normalizing

1503 North Post Oak Road, Houston, Texas - Sales Offices in Midland, Dallas, Denver, Tulsa, and Los Angeles.



50 years ago

June 29, 1911

Standard Oil Co. starts construction of a refinery at Manhattan Beach, Calif. It will be Standard's first plant on the West Coast. Also, Associated Oil Co., now operating the old Alcatraz 6,000-bbl. refinery, will build an asphalt plant at Gaviota, Calif.

Oil companies are up in arms over proposals of St. Louis councils to require storage of gasoline and oil in buried concrete reservoirs.

Manufacturers of casing-head gasoline meet in Pittsburgh to perfect an organization for their infant but rapidly growing industry. The new group will be known as Gasoline Producers Association. It will seek to cooperate with other associations, particularly the refining industry, which is starting a fight against the product made from natural gas.

25 years ago

June 25, 1936

Drilling starts on what is reputed to be the world's smallest oil lease, 24-ft. by 30-ft. plot set aside as a city traffic island at 23rd Street and Raymond Ave., Long Beach, Calif. It is in the Signal Hill oil field, where Jett Oil Co. plans a 5,575-ft. well. The 0.0165-acre site provides only enough area for the derrick with a 6-ft. space on one side for machinery.

Gigantic wildcat play builds up across eastern Colorado following active geophysical year and subsequent leasing of more than 3,800,000 acres spread over 40,000-sq.-mile region. Play overflows into western Kansas, Nebraska, and Wyoming, on the north.

The most active single drilling spot in Texas outside the East Texas field is Saxet Heights on the west edge of Corpus Christi where 35 rotary rigs now are keeping busy.

10 years ago

June 28, 1951

American Gas Association survey reveals gas utility and pipeline companies will spend more than 4½ billion dollars for construction of new facilities and plant expansion during the next 5 years. Half this expenditure will be on transmission lines.

Two new western Canada refineries start operation. British American Oil Co., Ltd., plant at Edmonton to process 5,200 bbl. of crude daily. It has first catalytic cracking unit in Alberta. Imperial Oil Ltd., installation at Winnipeg is designed for 10,800 bbl. daily. Cost is placed at $10,000,000.

JOURNALLY SPEAKING

On the Skids

WE'VE BEEN having quite a gasoline price war in Tulsa recently. That's hardly news, because gasoline price wars have been pretty common and pretty severe in a good many parts of the country this spring.

But it may be news that quite a few independent oil producers in this area are worried about the price war. In the past most producers never gave a thought to marketing, but now they realize that if the money doesn't come in from the service station there won't be any to go out to the crude producer.

"I understand," said one producer, "that the majors are losing a cent or two on each gallon of gasoline during the price war. So maybe we ought to help out our friends by not buying gasoline from any company that buys our crude. That way they won't lose so much money."

We didn't check with any majors to see if they consider this sound reasoning. But to satisfy the curiosity of independent producers who asked, we did make some inquiries as to how this particular price war got started.

The stories differed in detail somewhat, and nobody would swear to the facts. But as well as we could piece it together, it goes something like this:

In a small city in Central Oklahoma, a couple of hundred miles from Tulsa, a "skid station" opened up on the outskirts of town. A "skid" is a small filling station made up of prefabricated units mounted on skids that can be moved in or out in a hurry. It sells nothing but gasoline and offers no services at all—no air, water, lubrication, or rest rooms. It sits on a gravel driveway with no canopy, and the "office" is about the size of a phone booth—just big enough to hold a cash register. Its most prominent feature is a big sign announcing a low price for a brand of gasoline nobody ever heard of.

This particular skid was selling about 5,000 gal. per month, whereas a reasonably good service station will sell four or five times that. But its price was under that of a large "private brander," a marketer with no refinery but with a chain of superstations that normally sell 2 cents under the retail price of major service stations.

This private brander told the skid he would run him out of business if he didn't raise his price. The skid replied that he was entitled to a lower price because he had such a poor location, didn't give any service, and didn't sell much gasoline anyway.

But the private brander determined not to be undersold, so he lowered his price to the skid level to teach the skid a lesson. That made some majors mad. They were content to let the private brander sell 2 cents under them, but not more than that. So they cut their prices throughout that town to teach the private brander a lesson. After some seesawing, every station's prices were down.

That made the private brander mad, so to teach the majors a lesson he cut his prices in all his stations in Oklahoma City. Majors retaliated by underpricing him. The private brander then extended his lesson to Tulsa, and the majors continued their educational program here too.

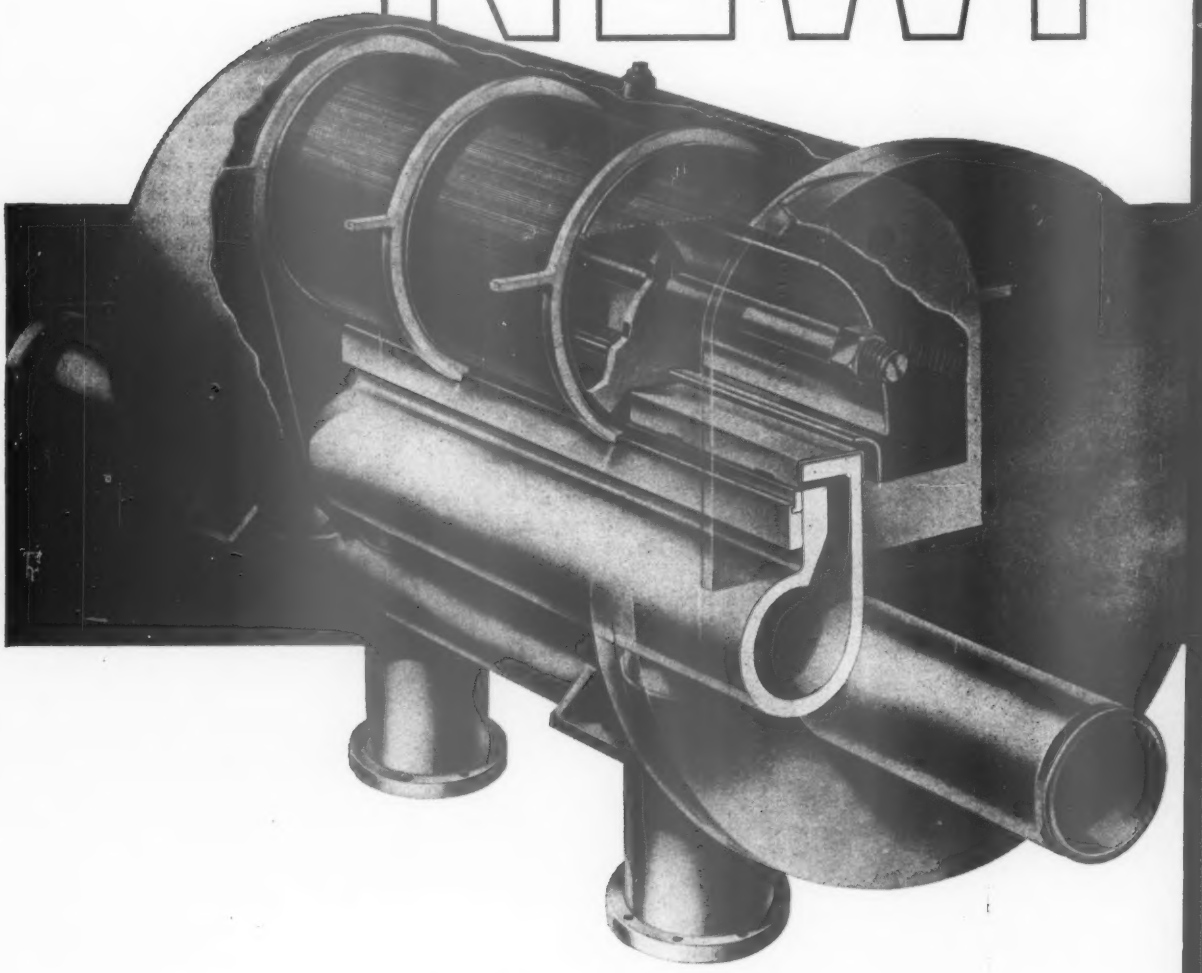
So for several weeks now in a big portion of Oklahoma the price level has been about 7 cents below normal on goodness knows how many million gallons of gasoline, and all because one little skid was selling a measly 5,000 gal. a month at a cut price.

We are told that this is a more-or-less typical pattern of how price wars start and spread. If anybody has the effrontery to depart from the customary method of marketing or pricing, somebody undertakes to teach him a lesson. It's not the money, it's the principle of the thing.

We used to hear a lot about "market leadership." Today it looks as though market leadership is on the skids.

—Henry D. Ralph

NEW!



Principle of operation

Feed is introduced through a flat nozzle at sufficient velocity to travel around the 300 degrees of screen. All material coarser than 40 microns is collected on the surface and discharged. Liquid and minus 40 micron material passes through the wedge bars and collects in a separate compartment for return to process. As an example, a refinery had trouble in the distillation column due to particle breakover into the light phase of a two phase condensate system. Installation of 300° DSM Screen corrected the problem by treating 450 gpm of condensate containing 100 ppm of trace particles. Results: 95% of all solids removed in a 60% by volume concentration; distillation column returned to full efficiency operation.

THE DORR-OLIVER 300° DSM® SCREEN

...Provides high capacity separations down to 40 microns

A new development in wet screening techniques, the 300° DSM Screen provides unique operational advantages for the Hydrocarbon Processing Industries. From the standpoint of *efficiency*, the unit will positively remove all particles 40 microns or larger from production streams. On a *capacity* for size basis, a single unit occupying only 9 cubic feet can handle 500 gallons per minute. And for design *flexibility*, DSM Screens can be supplied for atmospheric, vapor tight, vacuum or pressure operation. There are no moving parts and pump pressure is all that is required for operation.

Typical applications include:

- Removal of trace impurities in condensate lines from stripping operations.
- Counter-current washing or extraction in any number of stages.
- Classification of polymer crystals.
- Protection of phase separators in multi-liquid phase systems.
- Protection of distillation columns.

If you have a liquids-solids separation problem involving high capacities, small particles, any or no difference in specific gravities, or two or more liquids, it will pay to investigate the 300° DSM Screen. As performance characteristics vary with the material being handled, Dorr-Oliver has trial units available on a minimum rental basis for pilot or semi-works testing. For more information, write to Dorr-Oliver Incorporated, Stamford, Connecticut.

DORR-OLIVER

WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT

GOOD MEN GOOD TOOLS

Dependable remedial and stimulation service demands both. Baker offers both.

YOU ARE LOOKING at four of the most respected well-service tools in the industry. They command respect because their performance is consistent and reliable. They have proved themselves in thousands of critical downhole operations.

Simplicity is important in service tools. A simple tool is a reliable tool—and it is easier to control when it's in the well. Simplicity of design is one important reason for the success of Baker service tools.

YOUR BAKER SERVICEMAN lives and works in your area—and he knows the well-service problems of your area.

His local knowledge is vital. It helps keep him—and you—out of unforeseen situations. It helps him sense trouble before it starts. It guides him—and you—when you get into something you couldn't anticipate.

A Baker Serviceman does his work with confidence and authority. He knows his area, and he knows Baker tools. He's a tool specialist. Baker tools are his *only* business. He's a good man to call for your next remedial or stimulation job.

Baker provides the right tool (or tools) and accessories for any remedial or stimulation job.

1 Baker Retrievable Full-bore Cementer (Product 410) is an important squeeze cementing, fracturing, acidizing, testing packer. It is teamed with **2** Baker Retrievable Bridge Plug (Product 677-C) in straddle operations, either single-zone or selective multiple-zone. Cementer and Plug together can straddle a virtually unlimited distance. And any number of zones can be treated in one round trip. **3** Baker Drillable Cement Retainer (Product 400) sets the industry standard for dependable high-performance squeeze cementing. **4** Baker Drillable Wire Line Bridge Plug (Product 400-N) is the industry's most available and most reliable bridge plug.

BAKER REMEDIAL AND STIMULATION TOOLS

BAKER

BAKER OIL TOOLS, INC. HOUSTON / LOS ANGELES / NEW YORK

This new Harris bill could be the answer

THE NEW GAS BILL introduced by Rep. Oren Harris deserves to be studied by the industry with open and receptive mind.

It is the product of many years of close association with the problems of gas regulation and of intimate familiarity with the conflicting interests of the various segments of the industry.

While it may not suit anybody completely, it may well be the "last best hope" for getting out of the present mess which is rapidly becoming intolerable to everybody.

THE LOUD SILENCE which greeted the bill's introduction is, paradoxically, a good omen. The fact that nobody has hastened to praise or condemn it indicates that all view it with mixed emotions. This augurs well for objective study of its provisions.

The bill is a compromise, as most legislation of this type must be. For purposes of discussion and negotiation it includes provisions originating in diverse sources, some of which may prove to be inconsistent, unnecessary, or impractical.

But certainly it cannot be tagged as a "producer bill," a "pipeline bill," a "utility-commission bill," a "coal bill," or given any other special-interest label. Thus it should be the framework for earnest discussion of legislation in the public interest.

Producers won't embrace the bill. Instead of complete decontrol which they have demanded as a matter of principle, it continues federal regulation of field prices and imposes severe limitations on freedom of contract.

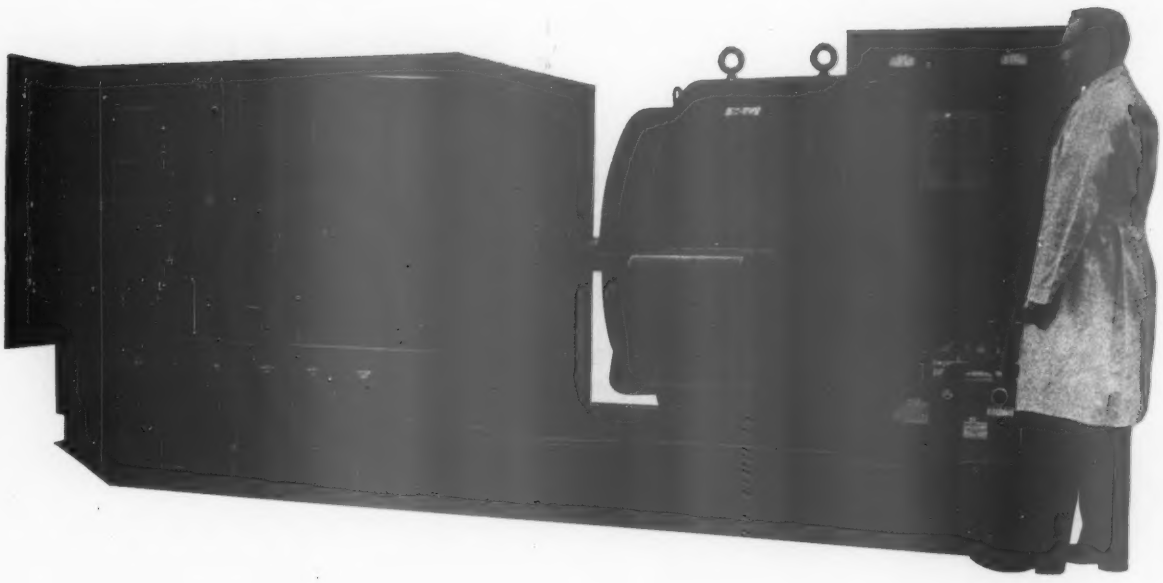
But it also imposes several limitations on FPC's regulatory authority. It frees producers from control as individuals and puts the regulation on the gas itself with the injunction that gas is to be priced as a commodity and not as a public-utility service.

The objection still remains that the producers' price may be subject to the arbitrary whim and caprice of the regulators. But the scope of this caprice is greatly circumscribed and a new standard—"reasonable market price"—is set up. Perhaps this is the most that producers can expect in the present political climate.

LIKEWISE, pipelines, distributors, the FPC, and state utility commissions may find the bill short of their desires and yet an acceptable political compromise.

The point is that nobody is going to get everything he wants in new gas legislation. Yet new legislation is imperative.

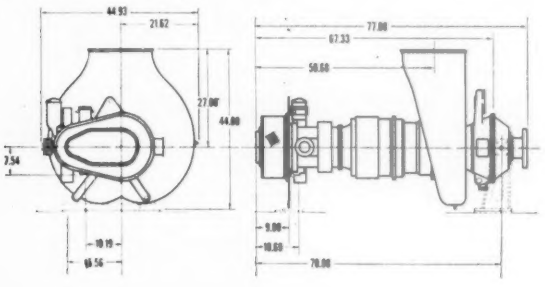
This bill is not an attempt to please everybody, but is a sincere effort to frame workable regulation. If the various affected interests find that they can live under it they should welcome early consideration and refinement by appropriate congressional committees.



800 KW!

Solar industrial gas turbine generator sets ideal for peak loading or constant duty

Versatile, compact industrial generator sets powered by Solar's T-1000 gas turbine engine have a nominal rating of 800 kw. They are ideal for either peak loading or constant duty electrical power applications. Simple design and rugged construction reduces maintenance



to a minimum. Installation is extremely simple. The engine is about 1/10th as heavy as diesel units of similar horsepower and occupies only 51 cu ft. No elaborate foundation or flooring base is required because the gas turbine is practically vibration-free.

Equipped with one of the several control systems available, the engine can be operated remotely and entirely automatically. It starts instantly and operates at full load without warmup, even after long periods of standby service.

Fuel economy of the Solar T-1000 engine is unmatched in its field. The engine runs equally well on a variety of fuels including gasoline, diesel fuel and natural gas. The exhaust may be used in a waste heat boiler or as combustion air in process apparatus or conventional boilers.

Cost of this gas turbine is competitive with diesel engines in many industrial applications. For further information on Solar's turbine-powered generator sets, its complete line of gas turbine engines or industrial compressors, write to Dept. J-115, Solar Aircraft Company, San Diego 12, California.

SOLAR

A subsidiary of International Harvester Company

PRIME FIGURE in the strike, NMU head Joseph Curran, tells why talks broke down.

STRIKE VIOLENCE erupted at Texaco's Eagle Point refinery as NMU pickets attempted to keep refinery workers from entering the plant.

Maritime Strike: Not Crippling—Yet

The Strike in Brief

STRIKING UNIONS:

Seafarers International Union, representing unlicensed seamen for Cities Service Oil Co., Richfield Oil Corp., Standard Oil Co. of California, Union Oil Co. of California, and several independent tank owners including Onassis and Kulukundis interests.

National Maritime Union, representing unlicensed seamen for Sinclair Refining Co., Texaco Inc., Gulf Oil Corp., American Oil Co., and independents including National Bulk Carriers, owned by D. K. Ludwig.

The Marine Engineers Beneficial Association, the Masters, Mates and Pilots, the American Radio Association, and the tanker section of the Radio Officers Union, representing crews of various companies.

THE ISSUES:

Hub of the dispute is the union demand for the right to organize crews on American-owned, foreign-flag ships.

The demand is aimed at ships flying the so-called "flags of necessity" of Liberia, Panama, and Honduras. Ships are so registered to escape high U. S. taxes, wages, and other operating costs.

Tanker owners say the device is essential to compete in international trade, as U. S. flag vessels have priced themselves out of all but the protected coastwise and U. S. foreign-aid business.

Other issues include NMU demand for 10-hour reduction in the work week to 30 hours, plus a variety of wage and fringe-benefit issues.

Most of the unions want a voice with the company in dealing with governmental subsidies and other matters affecting shipping.

A DEADLOCK over U. S. union demands to organize crews of American-owned, foreign-flag tankers last week threatened a long tieup of coastwise traffic serving companies in the dispute.

But most of the industry was not directly affected in the first days of the maritime strike, which began when contracts expired June 15. In fact, there was a greater impact on other types of shipping although the dispute centered around "flag of necessity" tankers registered in Panama, Liberia, and Honduras.

Indications were that the industry could weather a strike of several weeks without developing a serious shortage of petroleum products.

However, the strike did have these immediate results:

... A shutdown of Sinclair Oil Corp. refineries at Marcus Hook, Pa., Houston, and Corpus Christi, Tex., and Texaco Inc., refineries at Eagle Point, N. J., and Anacortes, Wash., and a big Texaco sales terminal at Bayonne, N. J.

At Anacortes, OCAW members voted to return to work June 22.

Coincidentally the Oil, Chemical

Tanker Shipments to East Coast

(Thousands of barrels daily)

	For year 1960 from		First quarter 1961 from	
	Gulf Coast	West Coast	Gulf Coast	West Coast
Crude	439	6	486	..
Gasoline	669	3	673	2
Kerosine	120	..	158	..
Distillate	474	5	675	5
Residual	137	16	152	12
Lubricants	21	1	18	1
Other	37	2	35	2
Total	1,897	33	2,197	22

and Atomic Workers union struck the three coastal Sinclair refineries and the company's East Chicago, Ind., refinery as well. The OCAW's master agreement covering 9,000 Sinclair producing, pipeline, transportation, and refining employes expired June 14. But only the four refineries were affected at first.

... **Halting of product** deliveries from a few refineries and terminals of the struck companies when Teamsters Union drivers refused to cross Maritime Union picket lines. However, the volume curtailed has been minor.

... **Crude-oil-buying** cuts by Sinclair and Gulf. Sinclair reduced its buying for its pipelines by 50% on a national basis. This cut its crude-oil purchases about 108,000 bbl. daily. Gulf cut purchases for its big Ostrica terminal by 30% for the month of June. Since June was more than half over, this meant a sizable cut, since the terminal handles between 100,000 and 200,000 bbl. daily.

Cause of shutdowns . . . The refinery and terminal shutdowns were not caused by crude shortages brought on by the strike.

They were the result of picketing by the National Maritime Union, one of the two major unlicensed seamen's unions on strike, and refusal of OCAW workers to cross picket lines.

The refinery closings came in spite of a directive from OCAW president O. A. Knight that members continue to work where contracts are in effect.

"For the protection of our union and its members against discharge and heavy losses, you are hereby instructed to immediately order OCAW members where necessary to continue to work and man plants where contracts are in effect," Knight wired local unions.

However, Sinclair OCAW units refused to cross maritime picket lines because their own contract had expired. Therefore, the no-strike clause under which they would be liable for damages for work stoppage was not in effect. Knight shortly afterward made the strike official.

Little immediate effect . . . The effect on most of the industry was minimized in the early stages of the maritime strike for various reasons:

... **Several companies** are represented by unions besides the Seafarers International Union and the National Maritime Union, which are spearheading the strike.

For example, independent unions represent crews abroad tankers of Standard Oil Co. (N. J.) affiliates, Socony Mobil Oil Co., Inc., Atlantic Refining Co., Tidewater Oil Co., and Sun Oil Co. They continue to work under their existing separate agreements and have not been touched by the strike.

Hence, crude and product deliveries to these companies on the big Gulf-East Coast run are normal.

... **Foreign-flag ships** bringing imports to the U. S. have continued to operate unhampered. Crews are represented by foreign unions and do not observe picket lines of American unions which are battling to organize these foreign crews.

... **Inventories of products** of the struck companies are sufficient to supply service stations for several weeks.

... **Inventories of crude,** even for refineries which depend in large part on supplies tankered from the Gulf Coast, are sufficient to maintain operations for a few weeks. These will be supplemented by imports, which could be stepped up in the emergency.

... **Spare refinery capacity** of unaffected companies could be used to offset at least partially the loss of the five closed plants. And it is sufficient to take up some of the slack left by curtailed operations of refineries which lose their Gulf Coast crude supply.

The strike, if prolonged, might be expensive for the companies directly hit. But through exchanges the industry could continue to supply products to the public for several weeks, perhaps longer, without any serious shortage.

Some independents sign . . . Some independent tanker owners appeared to break ranks on the foreign flag issue, but the compromise was more academic than actual.

On the eve of the strike, the SIU and the Marine Engineers Beneficial Association won the right to try to organize foreign-flag vessels of a few companies, mainly dry cargo carriers. However, virtually no foreign tonnage is involved.

A union claim of settlement with two big tanker owners, Victory Carriers, owned by Onassis interests, and Kulukundis Shipping Industries, was disputed by the companies. "We haven't signed anything," a spokesman said. "We are still negotiating."

The concession by the shipping companies that did sign amounted to giving the unions access to foreign-flag ships — if they had any now or in the future.

"The important thing," a union spokesman said, "is that they have recognized what the National Labor Relations Board previously gave to us—and that is our right to organize American-owned vessels of foreign registry engaged in American-foreign trade."

It was the favorable NLRB rulings earlier this year which gave the unions the incentive to go all out in current negotiations to win the big foreign-flag prize. Some 11 mil-

lion tons of shipping, half of it tankers, employing 30,000 men are involved in the tug-of-war over "flag of necessity" fleets.

Bargaining stalled . . . The strike was called in spite of an eleventh-hour appeal by President Kennedy for the maritime workers to remain on the job.

There was little if any actual negotiating taking place. The exchange of charges in public was a measure of the bitterness of the deadlock. A union spokesman accused the tanker owners it has under contract of trying to "bribe" the union with wage and other benefits if it would drop the foreign-flag issue. The tanker owners said the union leader was "lying in his teeth."

The NMU filed an unfair labor practice charge against the tanker owners accusing them of refusing to bargain in good faith. The union said it wanted to discuss the economic proposals before proceeding to its foreign-flag demand. The tanker groups said the union demanded acceptance of its economic package involving a 20% pay increase before discussing any other contract provisions.

Shippers' view . . . The national labor policy committee, representing ship operators, charged that the industry was being made the victim of a behind-the-scenes power struggle.

Monthly earnings of American seamen, including pension and welfare benefits, are $660, the shipping group said, and asked the reason for the new demands.

"The answer is a power struggle between union leadership in two different groups for domination of the entire maritime industry," the policy committee said. "Each group, regardless of the economics of the situation, has attempted to outdo the other—and American shipping has been caught in the middle."

The unions seemed to be pushing themselves toward a no-compromise position from which it will be difficult to retreat. Tanker owners said they could not turn over the foreign fleets to American unions without destroying their ability to compete in international trade.

Without government intervention to invoke the injunction provisions of the Taft-Hartley Act, all signs pointed to a long strike.

Big, New Products Line Planned

• Suwanee, talked as a competitor of Plantation for 5 years, may well get off the ground in the next few weeks.

THE long-talked-of Suwanee Pipe Line, which would serve almost the same territory supplied by Plantation Pipe Line, is apparently much closer to becoming a reality.

Representatives of interested companies met last week to iron out remaining problems. Construction plans are expected to be announced soon.

Interested companies include Cities Service, Continental, Gulf, Phillips, Pure, Sinclair, Standard of Indiana, and Texaco. Offices would be in Atlanta, where Plantation has its headquarters.

Revived interest in the line is evidenced by incorporation of Suwanee Pipe Line Co. in Delaware. The project has been under consideration for about 5 years.

The expected decision to go ahead is believed to have been dictated primarily by economic factors. Plantation is a common carrier. Proponents of the new line are its customers. In this era of extreme cost-consciousness these customers would like to share Plantation's profits and dividends.

Plantation has been a profitable operation. Its operating revenue in 1960, was $35,568,536. It had a net income of $7,741,154 and paid out $8,160,000 in dividends.

The Plantation system runs from Baton Rouge, La., to Greensboro, N. C. It has laterals to Birmingham and Montgomery, Ala., Chattanooga and Knoxville, Tenn., and Macon and Columbus, Ga.

The route of the Suwanee line has not been disclosed. Since five of the eight companies interested in it are part of the new Dixie Pipe Line Co., there is speculation that the lines will be parallel. Dixie's right-of-way is south and east of Plantation.

The five companies interested in both Dixie and Suwanee are Gulf, a Dixie participant through Warren Petroleum; Standard of Indiana, through Tuloma Gas Products; Cities Service, through Empire Gas & Fuel Co.; Phillips, and Sinclair. Humble, through Standard Oil Co. (N. J.), and Shell, two other participants in Dixie, have the major interest in Plantation.

Peace River Pipeline Extension Mapped

PEACE RIVER Oil Pipe Line Co., Ltd., which moves crude from northern Alberta to Anacortes, Wash., through a hookup with Trans Mountain Oil Pipe Line Co., is getting ready to link its system with eastern outlets.

The company is taking bids on a proposed 161-mile 12-in. extension of its 107-mile Valleyview-Edson line.

This extension would run from Fox Creek station southeasterly to Edmonton.

In addition, 7.5 miles of 8-in. lateral line will link a processing plant at Windfall to the main line.

Peace River gave few details in announcing the start of work. It did say the initial capacity of the proposed extension will be about 40,000 bbl. daily and that capacity will go up to 55,000 bbl. after more facilities are installed later.

Peace River's existing system carries crude from fields in the Sturgeon Lake area of northern Alberta to Trans Mountain's pipeline at Edson.

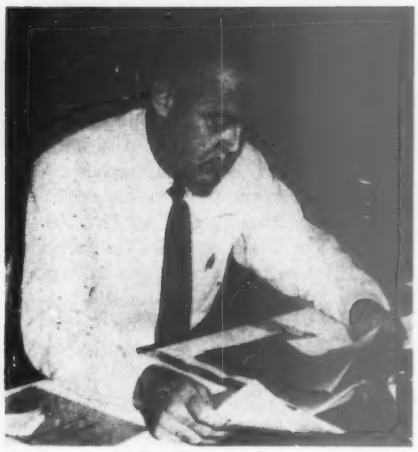
The Windfall lateral brings condensate into the picture. A gas-processing plant is scheduled for completion in Windfall field January 1, 1962.

Condensate from this plant has been included in plans of Westalta Products Pipe Line, Ltd., for a natural-gas-liquids gathering system. Plant production will be an estimated 14,600 bbl. daily.

Peace River's permits from the Alberta Government for the extension to Edmonton and the Windfall lateral date back to 1958-59, but the projects weren't put on the active-planning list until recently.

Britamoil Pipe Line Co., Ltd., subsidiary of British American Oil Co., Ltd., operates Peace River.

Will Petroleum-Engineering Schools



Dr. Carl Gatlin

Fewer and fewer students are enrolling in petroleum engineering.

This year's graduating group was the smallest in years, and the number of freshmen and sophomores this year is smaller still. If the trend continues, it could close many petroleum engineering courses in universities which have fed a steady stream of talent into the petroleum industry over the years.

A story outlining the approaching shortage of engineering talent was presented in the Journal last week (June 19, p. 59). This week the Journal presents an interview between Journal Editor Robert J. Enright and Dr. Carl Gatlin, chairman of the Department of Petroleum Engineering at the University of Texas.

In years past, Texas U. has had the largest crop of P. E. graduates in the country. Says Dr. Gatlin: "The times have changed."

Q. You have predicted a "drastic shortage" of petroleum-engineering graduates by next year. Are the P. E. schools really in danger of going under?

A. Very definitely, unless something happens to change the trend.

Professor Whiting's (Robert L. Whiting, Texas A&M) statistics show the national total for bachelor's degrees awarded in petroleum engineering was roughly 800 in 1957. It was down to 400 in 1960. This year will see another sharp drop and 1962 an even sharper one.

Some universities have already merged petroleum engineering with other departments, and several others are faced with this possibility.

Q. You mention other schools. I take it that the situation is not good at the University of Texas either?

A. It's pretty desperate. I think it startling to consider that our petroleum engineering school, enrollmentwise, has gone from the largest to the smallest engineering department at the university in less than 4 years. We're graduating about 60 this year, which isn't bad. But from here on it gets rough. We have only 27 juniors, 12 sophomores, and 14 freshmen. As a general rule, you can count on only about half of your freshmen going on through to get degrees.

We looked the other way in February to offer our sophomore course with only eight students—the minimum is supposed to be 10. And of the eight, two had failed the previous semester. If we don't get some transfers from other engineering courses or from junior colleges to this class, we're in trouble. We didn't get any at mid-term, though we normally do.

Q. Does this mean that the petroleum-engineering department at Texas U. is in danger of going under?

A. I can't speak for the university administration. But, in my opinion, yes. I don't see how we can carry a department if enrollment continues as low as it is now in our freshmen and sophomore classes.

I would think that we'd need to graduate about 30 a year to stay in business. It may be worth noting that the university abolished departments in meteorological and ceramic engineering when enrollment continued below this level.

Q. Why is petroleum-engineering enrollment down so severely?

A. It's a direct consequence of widespread pessimism over the "dire straits" of the oil industry.

Newspapers for months and months have been full of moaning and groaning statements by oil people due to heavy oil surpluses here and abroad. In Texas, for instance, this 8-day-allowable business has been pounded home time after time. And the majority of newspaper readers think this means Texas wells are producing at only 25% of normal rates. This just isn't so.

Certainly the world has oil productive capacity greater than its demand. But what industry doesn't have this situation? Look at the automobile, steel, coal, or nearly any other industry you can name. All have capacity to produce much more than they are producing now. It is this surplus capacity which we rely on in times of emergency, just as the head of a family uses his savings in times of distress.

Q. Have you done any sampling of student opinion on oil's future to bear this out?

A. I have. And the general opinion of high school and college-age kids in this area is that the oil industry is dying. Our own students have told me that classmates in other fields insist they are crazy for taking petroleum engineering.

This is the industry's fault. It just can't play Little Annie Rooney in every newspaper in the country and still expect bright young engineering students to be interested in this profession!

About a year ago, we sent out several hundred mailing pieces to high school and junior college counselors in Texas and Louisiana boosting petroleum engineering as a career. We pointed out the impending

Disappear?

shortage and predicted, because of this shortage, that the starting petroleum engineer by 1970 would command a salary of about $700 a month as compared with a probable $600 a month for other kinds of engineers. We invited queries for further information. To date, we have not had a single reply.

Q. We've been talking mostly about the quantity of new petroleum engineers. How about the quality?

A. It is deteriorating. And this worries us as much or more than the quantity. We're still getting a few of the real bright kids—but not our share. They're going into other things. Again, this is a result of oil's poor image. And it compounds the problem. For obvious reasons the industry really needs new people of increasingly higher caliber. But the trend is in the other direction.

Q. Dr. Gatlin, this next question is perhaps one of the most important. In our many talks recently with people in the industry, we've found most of them concerned over the current plight of the petroleum-engineering schools. But we've also found a good many reputable people, including engineers, who feel it would not be a great blow to the industry if these schools should disappear. These people base this conclusion mainly on a contention that they can take other types of graduating engineers, such as mechanical and chemical, and convert them into competent petroleum engineers as quickly and easily as they can petroleum-engineer graduates. What do you say to this?

A. I agree that any competent person with a good technical background can go into most any field and master its nomenclature and unique aspects. This takes time, however, and postpones the date when the young engineer starts paying his way.

Many of the major companies have concentrated training schools in reservoir engineering, well logging, and drilling which they send all their trainees through. Most of these companies feel their schools are the equivalent of a petroleum engineering degree, or even a masters degree.

We disagree with this completely for several reasons. First, the human mind can only absorb material so fast, and 10 or 12 hours per day for 2 weeks is not the equivalent of the same time spread over an academic year. Furthermore, in the university we teach a much broader approach than the typical oil company school. In particular, we go into many subjects which are controversial from what we hope is an unbiased position. Company schools can become an exercise in using the company manual.

There are also the smaller oil companies, the service companies, and others who employ our graduates, expecting them to know something about petroleum technology the day they go to work. It is in this diverse demand atmosphere that we have to work. The very fact that many oil companies have special schools proves that specialized training in the field is required. The error they make is in sending everyone through the same program.

A petroleum engineering graduate from a good school has no need for company training in basic reservoir mechanics, and he should be expected to proceed on his own initiative into the procedures and peculiarities of the individual company. The same can generally be said for schools in well logging and drilling. Hence the oil company which sends everyone through the same training procedure is wasting money.

If I were running an oil company, I would certainly hire all kinds of engineers; however, I wouldn't send them all through the same training program. Those companies saying a mechanical, chemical, etc. engineer makes a petroleum engineer as quickly as a graduate petroleum engineer might look at their training system to see if it is possible to do otherwise.

In my own experience, the system was such that it was impossible to work at other than the pace of the group during the trainee period. Industry doesn't utilize what we give them.

Q. Could the industry meet its engineer needs from these other sources?

A. I seriously doubt it. A point to remember is that petroleum-engineer grads are largely a captive crop of talent for the oil industry. Oil must compete with other industries for the chemicals, mechanicals, and others. It is having very little luck right now picking up the top people in these and other engineering fields. And the competition is bound to get much keener.

Engineering enrollment generally has been shrinking in this country. About the only field bucking the downward trend—due to the glamor of the space age—is electrical engineering.

Q. In a recent interview on this general subject, an oil-company representative expressed an opinion that much of the decline in petroleum-engineering enrollment at Texas might be due to a new degree offered by the university in "engineering science." His point was that potential petroleum-engineering students might be signing up for this course instead. How about this?

A. I don't think so. It's possible that we might have lost a couple of boys this way but not many. The university has set up machinery for awarding B.S. degrees in engineering science and now has between 40 and 50 enrolled—all now freshmen, sophomores and juniors.

The majority of these boys, however, are those who would otherwise be working for degrees in physics, math, or some other science specialty.

Q. Doctor, you have predicted that a shortage of petroleum engineers will become acute next year. Do you see any signs that this shortage is already beginning to show?

A. We have strong hints that it is here at the university. And this is despite the fact that this year's graduating class is quite large compared to those coming along the next 3 years.

Demand here for petroleum engineer grads has been strong. As usual there was some difficulty in placing the bottom third of the class. Everyone wants the top of the class. But to my knowledge all of our 1961 grads not staying on for graduate work now have jobs.

I had a call from a major company just the other

Gatlin Was Roughneck

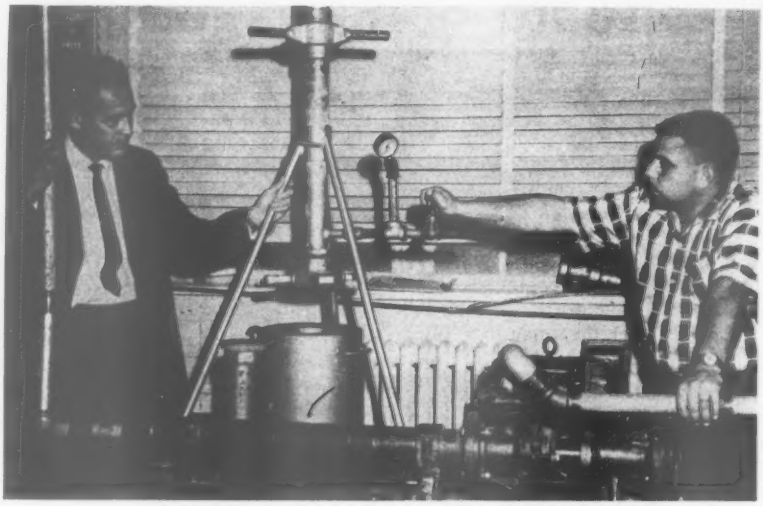
DR. CARL Gatlin, chairman of the University of Texas Department of Petroleum Engineering, has had industry experience outside the classroom.

The son of a driller and tool pusher, he was roughnecking at 15.

After graduating from the University of Southern California, he worked for Phillips, Anderson-Prichard, and Texas Crude.

Gatlin got a master's degree from Tulsa University in 1955 and taught at TU until 1957. He earned the Ph.D. in 1959 at Pennsylvania State. His degrees are in P. E.

Texas hired him in 1959 and last year made him associate professor and department chairman.



DR. GATLIN talks up the oil industry with his students and others.

day wanting to hire petroleum-engineer graduates. I had to tell them we had none left. If this is the case now, with 61 boys graduating this year, what do you think the situation will be by 1963 and 1964 when it appears we won't graduate more than a dozen or so each year?

Q. What about enrollment in petroleum-engineering graduate work at Texas U.? Is enrollment down there also?

A. To the contrary. Graduate enrollment is booming. It now is at an all-time high of some 42. And we expect it to increase further to about 50 by fall. The trend is for more boys to go after masters and even Ph.D. degrees in petroleum engineering.

It's interesting to note that up to now the department has graduated only four Ph.D.'s since it was created, whereas we have 12 in school now working toward doctorates and expect close to 20 by fall. Unfortunately, with the sharp declines in undergraduate enrollment, we can't expect the number of graduate students to remain high either.

Q. How do you account for the unusually large number of graduate students?

A. The trend toward graduate work is occurring in all engineering. I think it stems from the realization of our students that future success in a technical career is going to require more and more advanced training. I also believe that interviewers from the research departments are finally helping to sell this point of view.

We consider it a healthy trend and certainly encourage those capable of benefiting from graduate work to pursue it.

Graduate work in petroleum engineering is really in its infancy.

Q. Do you think that the larger petroleum-engineering schools may ever again turn out scores of graduates per year each as in the middle and late 1950's?

A. No. And I hope we never again have such huge classes. We were turning out too many. I would rather be a little short than way over.

Here at Texas I would much prefer to graduate between 30 and 40 boys a year and have a real strong program. But the trouble is that we're sinking way below this level—so far below that I don't see how we can keep going unless something is done. Many departments at the other colleges and universities are in the same boat.

Q. You are convinced, Dr. Gatlin, that the prime cause of plummeting enrollment has been the industry's prolonged use of the wailing wall before the public. Now is there anything the industry can do to help reverse this trend and increase enrollment?

A. I think it can do something—and must. These kids have to be convinced that the industry isn't dying on the vine. They have to be shown that it is a dynamic industry that is going to grow tremendously. This is fact. Exploding population over the world and the increased mechanization of underdeveloped countries guarantee it.

Young people must know that atomic energy, for instance, isn't going to displace oil and gas.

We in the department jump at every invitation we get to speak to these young people and sell them. But we can't get out and solicit speaking engagements. The industry can.

Right now the industry isn't even selling its own. Historically, we estimate 60% of our students have come from oil families or oil areas where the boy has worked a bit in the field or associated with others who have. Current rock-bottom enrollment shows plainly that oil people, just as much as the general public, have fallen victim to this unjustified pessimism.

The industry must realize what is happening and act quickly or it is in for deep trouble. It should present itself as a vital industry, still reasonably free from the paralysis of federal control, in which the sky is the limit for the man with ability and drive.

Culberson Dead

OLIN CULBERSON, the "champion of the independent" on the Texas Railroad Commission, died June 22.

He suffered a heart attack the day before and was taken to an Austin hospital.

Culberson, 74, was first elected to the commission in 1940 and since then had been reelected to three more 6-year terms.

He was a county judge before becoming a hearing examiner for the commission in 1932. He was chief examiner when he first ran for election to the commission.

Gov. Price Daniel will appoint a member to serve in Culberson's place until next year's general election. At that time someone will be elected to fill the remaining 2 years of Culberson's term, which expires January 1, 1965.

Coal Wants More Gas Rules Than Proposed in S. 666

COAL interests are opposing S. 666, controversial natural gas bill, because they want a stronger measure.

Jerome J. McGrath, representing the National Coal Association, criticized S. 666 in a statement to a Senate committee holding hearings on the bill. The committee plans to hear two more witnesses at an unannounced date.

The coal spokesman urged action to make sure "coal will be placed on a more equal footing in the marketing of its products."

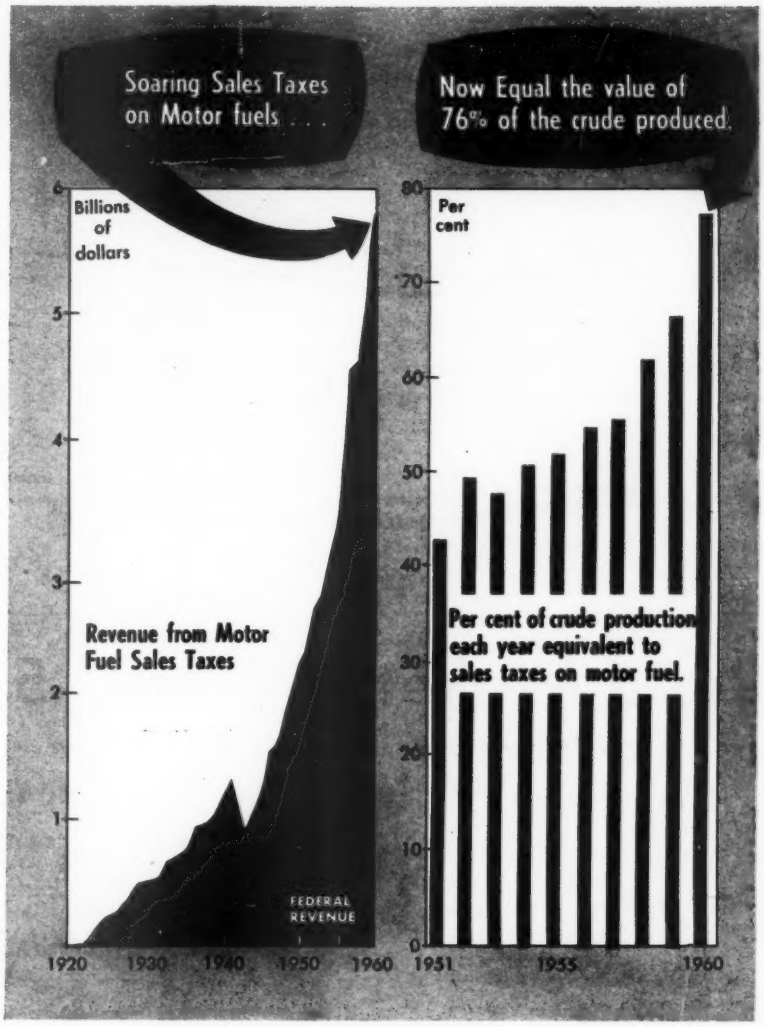
McGrath's objections to S. 666 include:

... **Direct sales** of gas are not brought under Power Commission regulation.

... **Rate tilting,** which coal wants banned, is not considered.

... **Maximum underground** gas storage is not encouraged.

Gas industry officials have attacked the bill as going after symptoms of trouble in the FPC and not after the root of industry ills. (OGJ, June 12, p. 79).



. . . *And Gasoline Tax Revenues Will Grow*

THE CHART on the left shows how state and federal revenue from motor fuel taxes has pyramided.

And it's almost certain that the tax take on motor fuels (gasoline, diesel and LPG) isn't going to stop at the 1960 figure—$5.7 billion. The reason: New state taxes, an expected extension of the current federal tax on gasoline, and higher diesel taxes.

Only a sizable cut in demand could cut these tax revenues.

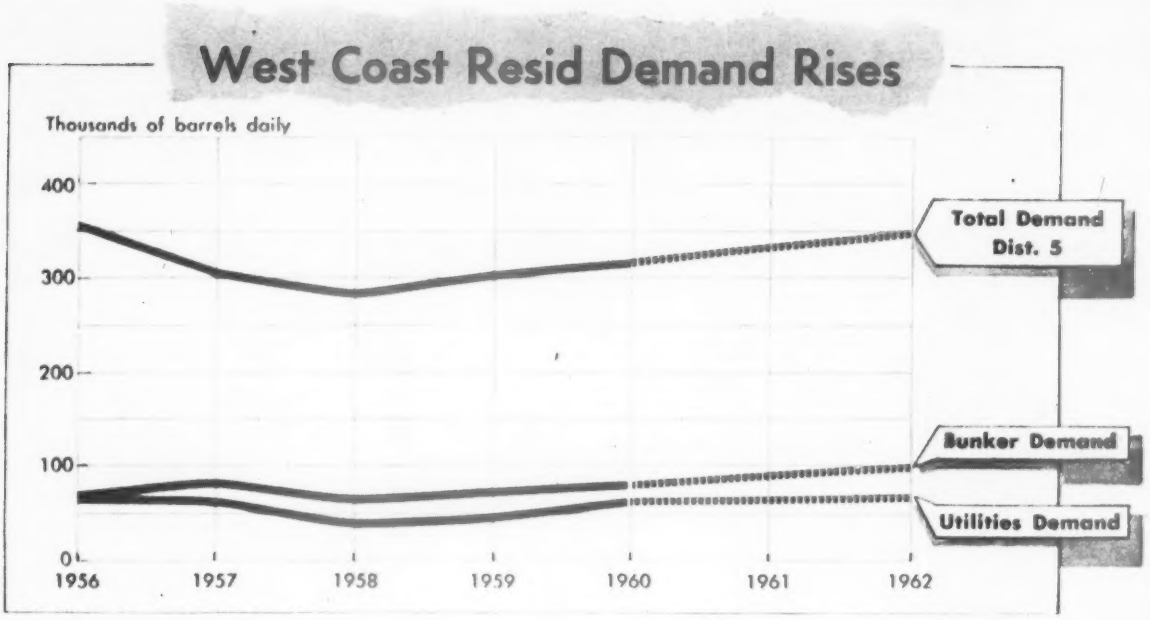
Both branches of Congress have approved President Kennedy's proposal to extend the "temporary" 1-cent additional tax on gasoline until 1972. So the federal bite out of each gallon of gas will continue at 4 cents for at least 11 years.

In addition, the Senate and House have voted to increase the tax on diesel. These taxes are included in the Highway Bill now in conference committee to iron out differences in the Senate and House versions.

Since both houses approved the tax proposals they are expected to be in the final version of the legislation.

Legislatures in Alaska, New Jersey, Pennsylvania, and Washington have raised gasoline taxes this year. Alaska has gone from 7 to 8 cents a gallon; New Jersey from 5 to 6; Pennsylvania from 5 to 7; and Washington from 6½ to 7½ cents.

Proposals to raise gasoline taxes have been made in three other states — Missouri, Delaware and Vermont.



Resid Market in District 5 to Hold Firm

• Total demand in 1960 was 3.6% above 1959 and is remaining firm thus far in 1961. Refiners also have trimmed stocks, cut yields to where local output is near local demand. New gas pipelines may affect marketing in 1962.

Carl J. Lawrence
West Coast Editor

RESIDUAL fuel oil demand has regained some of its old vigor on the West Coast despite a big influx of natural gas into the area. And all things point to a continued healthy resid market for at least a couple of years.

This new look of residual shows two trends emerging:

... Refiners have changed yield patterns to balance residual output with domestic demand. This should eliminate any surpluses which might be dumped on the East Coast market at distressed prices.

... Bonded fuel-oil imports are growing on the West Coast. Until last year importing Bunker "C" in bond was virtually unheard of, but such imports hit 17,787 bbl. daily in 1960 and ran about three times this rate during the first quarter of 1961.

Most oil men expect demand for residual will hold at least until 1962. This will be a critical year since two pipelines will start moving more gas into the state. The 36-in. gas line from Alberta to San Francisco will be completed by then and more gas will be coming into Los Angeles through the El Paso Natural Gas Co. system.

But even with these new supplies of gas, the residual-fuel outlook for District 5 is good due to the fast-climbing demand curve for energy.

A long-range forecast made by Southern California Edison Co., the big electric utility headquartered in Los Angeles, even calls for fuel-oil imports on the coast in 1964. Edison is one of the state's biggest fuel-oil consumers and the prime mover behind the gas line proposed from Texas through northern Mexico into Los Angeles.

Oil men aren't too worried that gas will cut deeply into the residual market. The new gas line, coupled with smog regulations which ban fuel-oil burning in Los Angeles, will affect the market, but in the long pull residual should continue to gain.

Dry weather the last 2 years also has helped the fuel oil market. Power that normally would have been generated by water has been generated by fuel oil. During 1960 utilities' demand averaged 64,019

A Look at District 5 Resid Market

	Barrels Daily			Barrels
	Total Demand	Demand in 5 Western States*	Refinery Output	Year-End Stocks
1956	352,350	302,672	331,227	13,262,000
1957	317,025	267,279	336,754	26,813,000
1958	292,272	236,888	300,476	32,202,000
1959	311,143	237,540	281,151	22,236,000
1960	322,277	254,992	280,172	14,451,000

*Includes company use and bunkers. SOURCE: Bureau of Mines.

bbl. daily. This was 20% of total demand and 13.4% over utility demand in 1959.

Total demand in District 5 reached 322,277 bbl. daily in 1960 for a 3.6% increase over the previous year. This increase was due to a 11.2% increase in civilian demand. Total demand ran at 351,000 bbl. daily during the first quarter of 1961, which indicates 1961 will be another year for residual.

Bonded imports . . . The bonded fuel oil coming into California ports is taking up the slack between demand and a decreasing supply.

Available supply of resid has declined. The amount being produced and the amount held in stocks has dropped. During 1960 District 5 refiners produced an average of 280,172 bbl. daily of residual. This is a drop in the daily average of 73,828 bbl. from the 1956 yield. Too, residual yield now is only 24% of runs. It was up to 31% in 1956.

Residual stocks have taken a big drop in 4 years. Stocks reached 32,202,000 bbl. at the end of 1958. They shrunk to 14,451,000 at the end of 1960, and are about 15,000,000 at present.

With stocks worked off and residual yields held down, there is room for the bonded imports.

Bonded imports have been running high this year, but apparently there is no danger of the bonded fuel creating a market disturbance.

"There is no point in bringing the stuff in if you can't sell it," one observer points out.

The market for bonded fuel on the West Coast is estimated at about 60,000 bbl. per day. This market isn't expected to change unless some dramatic switches in shipping patterns develop, and this is unlikely. The bonded fuel can be sold only for bunkering ships in foreign trade.

The bonded fuel imports in the first 4 months of this year are running almost three times higher than the 1960 average. The Bureau of Mines reports show bonded receipts reached 100,857 bbl. daily in February. However, the bureau admits this figure is suspect and is double checking it. During April the flow was 63,133 bbl. daily, which is well above the previous high of 42,833 bbl. daily discharged during September 1960.

Bunkering ships always has accounted for a good share of the West Coast fuel demand. Bunker demand in 1960 was 80,005 bbl. daily, up slightly from the 1959 figure of 78,934.

Los Angeles (San Pedro) does about 50% of the bunker business and has a slight price edge. Bunker C sells at $2.20 a barrel at San Pedro with a 10-cent discount for contract accounts. The price is 5 cents higher in San Francisco, with about 30% of the market, and 40 cents higher in Portland and Seattle.

The outlook . . . If present trends continue in District 5, both refiners and producers should profit from the residual market.

For the refiner, a steady demand and balanced supply should lead to firm prices for a product that historically has fluctuated widely in prices. In the last 2 years, residual prices in Los Angeles have jumped from $1.50 to $2.15 a barrel.

For the producer, the increased demand for residual has eliminated shut-in production in California. When residual stocks were at their peak in 1958, shut-in production shot up to 56,913 bbl. daily in July of that year. Today there is no shut-in production in the state. And if this pattern continues, the increased residual demand may lead to the producers' dream—an increase in crude prices.

Now You Can Weld with Friction Heat

A METHOD for friction welding of pipe and other circular shapes of steel was unveiled last week by American Machine & Foundry Co. at the American Welding Society Exposition in New York City.

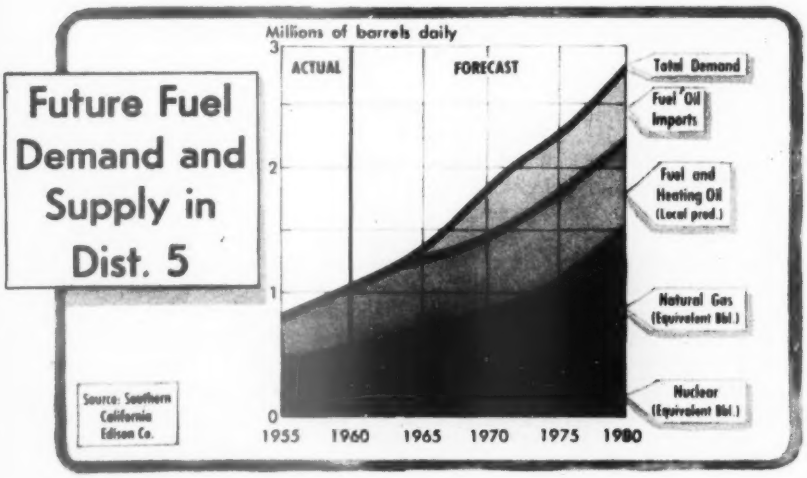
The process can be used for joining low-carbon steel to high alloy, aluminum to steel, copper to brass, and other combinations.

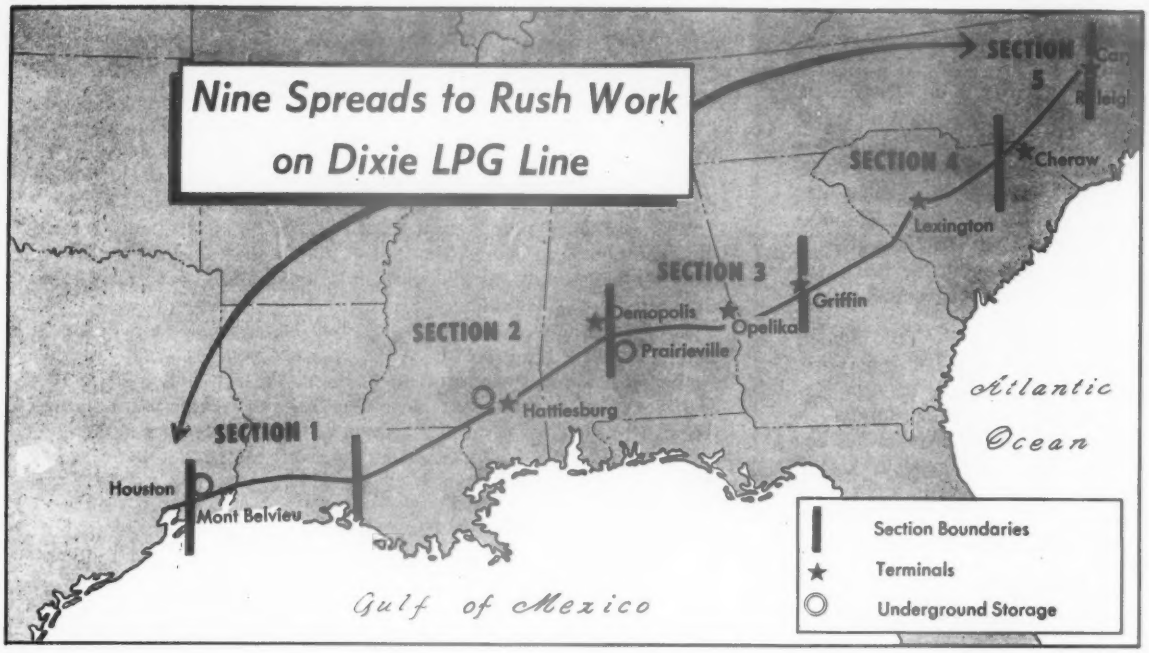
One section of pipe is held fixed and the other is rapidly rotated while being pressed against the first. After the friction heat builds up, rotation is stopped as quickly as possible, and pressure is increased and held until the weld is made.

In welding high alloy to low carbon steel, the rotating element spins at about 12,000 RPM., AMF said. Pressure is gradually built up during a 20-second period to about 2,000 psi. and held at that level for about 30 seconds. During that time, the temperature reaches some 2,700° F. and metal at the point of contact becomes molten.

About ½ second after stopping rotation, pressure is increased to 8,000 psi. and held at that level for about 1 minute, or until the temperature cools to 600° F.

For a given-size weld, AMF engineers say the friction weld is more efficient than conventional welds and has lower power requirements. They also point out that friction welding uses light pressures and high speeds so that less expensive machinery can be employed.





Work on Dixie LPG Line Will Start in July

• Eight contractors will handle pipe stringing and laying for the 1,077-mile project, nation's second big LPG system. Completion's due in 1962.

CONSTRUCTION of the nation's newest major pipeline—the 1,077-mile Dixie LPG system from Mont Belvieu, Tex., to near Raleigh, N. C.—will get under way next month.

The start of work will climax a rivalry between Dixie LPG Pipeline Co. and Trans-Southern Pipeline Corp. Both companies proposed LPG lines to serve the southeastern part of the United States (OGJ, Mar. 20, p. 77).

Trans-Southern, a subsidiary of Transcontinental Gas Pipe Line Corp., has not announced when and if it will start construction on its line, which would roughly parallel the Dixie project.

Dixie's will be the second big LPG system in the country. The first, Mid-America Pipe Line Co.'s 2,184-mile line from New Mexico to the upper Midwest, began operating less than a year ago.

Nine-spread job . . . Five construction contractors and three stringing contractors will share in the Dixie construction. Since the former will have a total of nine spreads at work simultaneously, the intricately engineered job should be completed in near-record time.

Pipe has been ordered, and stringing and laying are to begin July 15. Pipe laying should be completed this fall.

The entire system should be ready to go into operation soon after the first of the year.

One thing that will extend the interval between completion of the pipe laying and starting up: The need for an absolutely dry line. Because propane has an affinity for water, exceptional precautions will be taken to make sure the line is as free of water as possible.

The system will have a capacity of 50,000 bbl. per day. Its sources of supply include direct connections to Gulf Coast refineries and gasoline plants and several underground-storage points.

One of the supply lines will connect Humble Oil & Refining's Baton Rouge complex with the Dixie line near Baker, La. This will be an 11-mile 6-in. line.

Ten pump stations will be incorporated into the system, beginning with the initial station at Mont Belvieu. Three will be located in Louisiana, near St. Charles, Cecilia, and Baton Rouge; one in Mississippi, near Hattiesburg; two in Alabama, near Prairieville and Opelika; two in Georgia, near Griffin and Norwood; and one near Lexington, S. C.

Pipeline route . . . Route of the Dixie line will be generally south and east of the existing Plantation products pipeline and also south of the line proposed by Trans-Southern. It will be made up of 393 miles of 12-in., 310 miles of 10-in., 278 miles of 8-in., and 96 miles of 6-in. line.

River crossings will take about 6 miles of pipe. H. C. Price Co. is concrete coating 8-in., 10-in., and 12-in. line at its Harvey, La., plant for these jobs. Price is also somastic coating 93 miles of pipe at Harvey.

The design, engineering, and management of construction for the pipeline and distribution terminals are the responsibility of Service Pipe Line Co. and Phillips Petroleum Co.

The Dixie pipeline will be operated on a common-carrier basis.

Owners of Dixie are Warren Petroleum Corp., Phillips, Tuloma Gas Products Co., Humble, Union

Texas Natural Gas Co., Shell Oil Co., Sinclair Oil Corp., and Empire Gas & Fuel Co.

Contractors . . . These are the contractors who will build the line:

Houston Contracting Co., Houston, was the successful bidder on Section 1, 226 miles of 10-in. line from Mont Belvieu to Baton Rouge, La. This section involves two major river crossings, the Atchafalaya and the Mississippi.

Sharman, Allen, Gay & Taylor, Inc., Houston, won the bid on Section 2, 246 miles of 12-in. line from Baton Rouge to a point east of Demopolis. This section includes the crossing of the Tombigbee River.

H. B. Zachry Co., San Antonio, got Section 3. This 227-mile section consists of 144 miles of 12 in. and 83 miles of 10 in. It extends from near Demopolis to Barnesville, Ga.

O. R. Burden Construction Corp., Tulsa, will lay Section 4. This section, all 8 in., extends from Barnesville to McBee, S. C., close to the South Carolina-North Carolina border.

Stanley-Bledsoe Corp., Tulsa, will build Section 5, a 126-mile leg from McBee to Cary. It consists of 30 miles of 8 in. and 96 miles of 6-in.

Each of the contractors for Sections 1 to 4 will have two spreads at work while Stanley-Bledsoe will have one on the short final section.

Contractors who will divide the job of stringing the pipe are J. O. (Red) Willett Pipe Line Stringing Corp., Monroe, La., Section 1; Parkhill Trucking Co., Tulsa, Section 2 and the 12-in. portion of Section 3, and J. L. Cox & Son, Inc., Raytown, Mo., the 10-in. portion of Section 3 and Sections 4-5.

Gas Turbine Generators Can Be Marketed Now

NEARLY 150 natural-gas men and equipment dealers representing scores of companies returned to their home offices last week with a message for their bosses:

"We're sitting in at the birth of a brand-new, tremendous industry. We're talking about millions—maybe billions—of dollars."

The new industry: Do-it-yourself electricity (OGJ, May 1, p. 64).

The billion-dollar idea was given the Southern Gas Association's gas-turbine seminar in Houston by D. Dana Price, a Houston consulting engineer.

Price has helped with studies which conclude that the gas industry, with a selling job, can nearly triple its sales to schools, hospitals, and other large buildings by encouraging builders to install gas turbines to generate electricity and, with exhaust gases, provide year-round air conditioning.

Price said the cost of gas turbines should drop 50% as soon as they are in production. Payout should be 4½ to 5½ years. After that, he said, utility bills of a building should drop 35%—with summer air conditioning as a bonus.

He advised gas companies not to wait for more "experience" before pushing sales. Up to now they've moved cautiously.

Price contended that the 1,400 gas distributing companies in the nation could easily promote the installation of 1,000 gas-turbine units within the next year.

This kind of business should bring the cost of the units down to the $50,000 class, and would mean $50 million worth of business to the manufacturers—not to mention the increased sales of gas.

Eventually, as Price sees it, most new buildings would travel the do-it-yourself route, and the billion-dollar figure should be reached within a few years.

Gas-sales increase . . . No one at the seminar offered an estimate of how much of a new gas market will be created by the new gas-turbine business. But one gas-utility authority offered this example:

A high school in the Houston area recently was constructed without air-conditioning. The electric utility collected $12,517 in 1 year and the gas utility $2,177.

If a "compact" air-conditioned school—a new design that is catching on with school boards—had been constructed and conventional electric power purchased, the electric utility would have collected $23,285 and the gas company only $991 because little heat would be required.

But if the gas-turbine package had been installed in this compact school, the electric utility would have received nothing and the gas company about $12,000 for the year.

In pressing for an immediate effort to promote the project, Price said that at least two manufacturers now have the turbine utility packages available for sale and believe them to be sufficiently trouble-free to recommend to customers.

Canada's Oil Goals Depend on Exports

AN INDEPENDENT spokesman says continued exemption of Canadian crude from U. S. import quotas is vital to Canada's National Oil Policy.

Charles Hay, president, Independent Petroleum Association of Canada, told a recent Alberta Association of Petroleum Landmen Seminar in Calgary that Canada is well underway toward the target of 800,000 bbl. daily of oil and natural gas liquids by 1963.

"It is already evident to us that one of the problems of achieving the National Oil Policy target is maintaining the import privilege presently enjoyed by Canadian crude moving to U. S. market.

"The United States independent is nervous that our policy will result in his losing some of his domestic market," Hay observes.

"Some majors have expressed the fear that the exemption of Canadian crude from import quotas gives their competitors unfair advantage. Others state quite bluntly that Canada should sell its own crude in its own market before attempting to sell it to meet United States needs."

Hay says the IPAC is helping to provide "answers to all those statements."

The IPAC official predicts Canadian petroleum production may increase by at least 50,000 bbl. a day each year after 1963.

Coal Presses Attack on Resid, Gas Imports

• House subcommittee told that coal industry could be crippled if imports of resid and natural gas aren't held in tight check. Oil flings rebuttal.

COAL is keeping up its fight to get curbs on residual fuel oil imports and natural-gas sales.

Spokesmen for coal-mine operators and coal labor unions renewed the attack in testimony before a House Education and Labor Subcommittee last week.

The subcommittee is studying the effects of imports and exports on employment. Rep. John Dent (D.-Pa.), chairman, said coal is the first industry to be considered.

The coal men found a generally friendly reception, in contrast to their earlier appearance before the Senate Interior Committee to ask for a national fuels study (OGJ, June 19, p. 62).

They pleaded for action to keep U. S. coal production at 500 million tons a year. Currently, they said, it is running below the 400-million-tons-a-year rate.

Joseph E. Moody, president of the National Coal Policy Conference, declared that "excessive imports of residual fuel oil constitute a threat to the continued existence of the coal industry as a vital force in the nation's economy."

He said that for every million barrels of imported residual fuel oil, there are direct and indirect losses to the U. S. economy of more than $4,400,000.

These losses occur, Moody explained, through curtailment of revenue at the mines and through shriveling of wages and tax payments.

Natural-gas imports also took a clobbering from Moody.

"Each 6 billion cubic feet of imported gas will have the same effect upon the domestic coal industry as 1 million barrels of residual fuel oil," he said.

Getting specific, Moody told the subcommittee that one gas pipeline being built to carry Canadian gas to the Minneapolis, Minn., area "will have a capacity of 73 billion cubic feet a year."

"All we ask," he said, "is that we return to the 1957 base year as a measure of the reasonableness of imports—as the presidential proclamation so clearly called for."

Coal's aim along this line is to get resid imports held to the 1957 ratio of about 173,299,000 bbl., against 230,000,000 bbl. last year and the possibility of even more this year.

Other goals of the coal forces:

... **A "proper restriction"** on what spokesmen called "dumping of natural gas into industrial markets at price levels which generally undersell coal, plus a limitation on imports of foreign natural gas."

... **State Department efforts** to get some other countries to lower tariff and other barriers against U. S. coal.

... **U. S. leadership** in "stemming this tide which is leading toward Russian domination of world-fuel markets."

Oil counterattacks . . . Several oil companies and petroleum groups challenged coal's contentions.

In a statement filed with the subcommittee, Humble Oil & Refining Co. said "the substantial decline in coal production" is not attributable to "competition from heavy fuel oil."

Humble said "the over-all demand, averaging about 1,225,000 bbl. daily for heavy fuel oil in Districts 1 through 4, has grown very little in the last decade."

Quoting Bureau of Mines figures, Humble added that 1960 domestic demand was "only 16,000 bbl. per day above the 1950 demand and represented an increase of only 1.3% above 1950."

Humble called this "an insignificant growth."

The oil company said the rise in imports is merely "a shift in the source of supply" from domestic to Caribbean refineries.

Coal's market has fallen off, Humble argued, because consumers

Elk Hills Oil Swap Rejected by

CONGRESS has again turned down a Standard Oil Co. (Calif.) proposal to swap its reserves in the deep (Stevens) zone of Elk Hills for the Navy's holdings in the shallow zone.

Idea of the swap was to permit Standard to produce its share now, and allow the Navy to hold its reserves for use in an emergency.

Rep. Carl Vinson (D.-Ga.), chairman of the House Armed Services Committee, made a motion to reject the offer and 31 members of the committee voted to back him up. Two voted present and none voted against Vinson.

The action came after Standard of California officials urged the swap and called it a good deal for Socal and the Navy. However, Navy took a dim view of the proposal.

Rep. Vinson read an 11-page statement of objections, in which he pointed out:

... "There is no statutory authority" for the exchange.

... There is no evidence the Navy "could achieve any greater conservation of its oil" under the swap. And the proposal "might, in fact, harm Navy's position with respect to this reserve."

Standard of California officials said they are "extremely disappointed" by the decision of the committee which they consider "unwise" for the Government and the taxpayers.

The next step, Standard officials said, is for their company to bow out as operator without fee of the Elk Hills Naval Petroleum Reserve.

Standard served notice of termination last October but held it in abeyance pending outcome of the swap proposal. Under terms of the contract termination can take effect 6 months after notice.

Standard said it can "no longer economically justify" operation of the reserve without compensation.

The proposal. Capt. Kenneth C. Lovell, director of naval petroleum

prefer other fuels for some purposes and have learned to obtain more energy with less coal.

G. M. Foster, secretary of Standard Oil Co. (Calif.) said half of the postwar drop in soft-coal production is due to the shift by railroads from steam engines to diesels.

In a statement, he told the committee that most of the remaining half of the drop is due to a switch to oil and gas for residential and commercial space heating.

Therefore, he contended, oil and gas competition—rather than residual—has hit coal hardest.

He said "rationally and carefully calculated" utility loads show coal is gaining steadily, while resid "is merely holding its own."

Instead of further curbing residual imports, Foster added, Standard of California believes all import curbs on residual for Districts 1 through 4 "should be removed."

The Petroleum Industry Research Foundation, Inc., and the New England Council warned the subcommittee that if residual oil curbs are tightened, the result will be higher fuel costs and a loss of jobs in New England.

House Committee

and oil shale reserves, said: "I can find no justification in the interest of national defense for our buying what Standard is now trying to sell us."

On the other hand, George J. O'Brien, vice president of Standard, said "the Navy will make gains of over $250,000,000 in the long run under the proposal." He added that Standard, too, stands to benefit.

Standard's proposal was to swap its estimated 112 million barrels of Stevens zone crude for an estimated 84 million barrels of Navy's shallow zone crude. The Navy would come out ahead by 28 million barrels. Standard added that the value of the deep oil is $4 a barrel against $2.30 for the shallow zone crude.

Standard would get 90% of the shallow zone output until 26 million barrels had been produced. After that, Standard and the Navy would share equally from that zone.

Standard also agreed to buy any crude the Navy is unable to sell elsewhere.

Watching WASHINGTON

Clyde La Motte

• There will be a wait-and-see period on H. R. 7575 . . .

ANY PROGRESS toward legislation to improve the natural-gas regulatory mess will be a slow and painful process. So don't expect any fast action on the latest move by Rep. Oren Harris.

There will probably be no hearing on his bill (OGJ, June 19, p. 67) before this fall, meaning that little more could be accomplished than to set the stage for a congressional decision when Congress resumes next January.

Only a vigorous, all-out push by the administration could provide any hope for prompter action. And that doesn't appear likely.

The White House is keenly aware of the need for action, as evidenced by the fact that President Kennedy singled out the Federal Power Commission in his message to Congress on regulatory agencies.

Even so, the administration will move with caution. Note that while specific reorganization plans have been sent to Congress on several other regulatory agencies, none has gone up for the FPC. One reason, apparently, is that the administration wanted to wait until Joseph Swidler and Howard Morgan were seated so that White House proposals would get a stronger backing by the commission.

One producer-state congressman who has talked with administration officials about gas regulation says privately that they listened to him with interest but were noncommittal. And Harris himself seemingly has gotten no specific assurance of support.

What is likely to happen, therefore, is that the administration will quietly watch developments, send out feelers, and sit back and wait.

• Where is Justice Department heading in antitrust? . . .

SOME Washington oil observers are watching Lee Loevinger, the Justice Department's top antitrust man, with growing unease.

They note, for instance, that almost every time he shows up before a congressional committee to testify on some legislation he expresses a view that tends to jar the industry.

At one such hearing recently he made it clear that he looks with disfavor on the ownership of pipelines by refining companies.

Earlier he had warned that if there is any indication of collusion between companies in refusing to accept governmental research contracts because of the question over patent rights, such firms will be liable to antitrust prosecution.

Also, he would like to have subpena powers in civil antitrust investigations.

But what concerns some observers most of all is the feeling that the Justice Department is moving toward the approach of deciding how industry and business should be shaped up and operated, and then using existing laws or obtaining new laws to help them mold that "desirable" shape.

• Coal's drive for a fuels study may still bog down . . .

THE QUESTION of a fuels study is not settled yet—not by a long shot.

It was evident during the recent hearing by a Senate committee that several members of the group seriously doubt that anything of much value can come from such a study at this time. Equal doubt was expressed as to the need for a special committee to do the job.

As a result it may be several weeks, at least, before the committee studying the issue makes its recommendations.

British Columbia Oil Line May Spur Drilling

• Western Pacific pipeline from Taylor to Kamloops will open Vancouver area market to isolated B. C. oil fields. Result might be work for 50 more rigs.

A DRILLING program of 400 to 500 wells in the next few years will be touched off by a new pipeline to link British Columbia oil fields with Vancouver, B. C., refineries.

This is the prediction of Frank M. McMahon, president of Westcoast Transmission Co., Ltd., which will operate the 505-mile 12-in. line.

The project, now under way, will extend from Taylor to Kamloops, B. C., connecting with Trans-Mountain Oil Pipe Line Co.'s system to Vancouver. Trans-Mountain now supplies the 75,000-bbl.-daily Vancouver market with Alberta oil. Starting in November this oil will be displaced in part by British Columbia sources.

The new pipeline, to be owned by Western Pacific Products & Crude Oil Pipelines, Ltd., will provide the greatest single stimulus British Columbia exploration has yet received. It will offer for the first time a sizable market for the province's northern fields. Their isolation has retarded development heretofore.

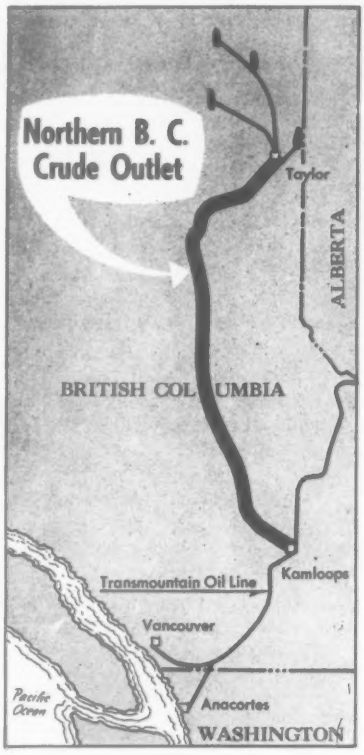
Westcoast Transmission, the dominant financial interest in Western Pacific, arranged private financing for the $35-million project. Design capacity will be 75,000 bbl. daily. However, production of no more than 20,000 bbl. daily is expected to be available within the next year.

Drilling program . . . McMahon expects 50 drilling rigs to be activated because of the new market outlet.

Both development and exploration drilling will be pushed.

The area to be served by Western Pacific now has seven fields with a total of 102 wells. These are Boundary Lake, Milligan Creek, Woodrush, Beatton River, Wildmint, Peejay, and Blueberry. Full development of these fields will result in an estimated additional 200 wells.

Principal operators in the Peace River area affected are British American Oil Co., Ltd.; Imperial Oil, Ltd.; Ohio Oil Co.; Pacific Petroleums, Ltd.; Dome Petroleum, Ltd.; Amerada Petroleum Corp.; Shell Oil Co. of Canada, Ltd.; Texaco Exploration Co.; Mobil Oil of Canada, Ltd.; Hudson's Bay Oil & Gas, Ltd.; Triad Oil Co.; Sun Oil of Canada; Union Oil Co. of California; Fargo Oils, Ltd.; and Western Decalta Petroleum, Ltd.



A development well can be drilled in about 3 weeks, the Westcoast Transmission announcement said. And 50 rigs are expected to be active around Peace River in the next few months.

Productivity and reserves . . . Proved and probable oil reserves in northeastern B. C. are estimated at 120 million barrels, a 10-year supply at a 20,000 to 25,000-bbl. daily throughput through Western Pacific.

Ultimate reserves have been estimated by the Canadian Petroleum Association at 10 billion barrels.

British Columbia's production has been running at about 2,500 bbl. daily. This volume has been trucked to local markets. Some 10,000 to 12,000 bbl. daily are expected to be available by the time the pipeline is completed.

In addition to crude oil, the line also will transport natural-gas liquids. Excess production of these liquids, now flared, has ranged from 600 to 2,000 bbl. daily.

Pipeline construction . . . Two contractors are working on the 12-in. line.

Dutton-Williams, Ltd., will lay 362.3 miles from Kamloops northward to the Prince George area, using two construction spreads working out of Quesnel and Savona. B. C. Canadian Bechtel, Ltd., will lay 142.7 miles from Prince George to Taylor with one spread working out of Prince George.

The pipe suppliers—Alberta Phoenix Tube & Pipe, Ltd., and Page-Hersey Tubes, Ltd.—have already rolled 10,000 tons of 12-in., and deliveries are being made to the right-of-way.

Westcoast estimates each spread will complete about 80 miles of line per month.

A 250,000-bbl. tank farm, an office, and a control room will be

INDUSTRY

New Mexico oil allowables are unchanged for July. They are 34 bbl. a day for southeast wells and 70 bbl. a day in the northwest.

Bishop Oil Co., San Francisco producing and exploration firm, plans to sell its oil and gas properties to Shell Oil for $5.6 million. Bishop directors approved a liquidation plan last week. Bishop has properties in eight states and Canada. Gross production averaged 2,213 bbl. daily during the first quarter.

Big purging job in eastern Pennsylvania required 112 tons of carbon dioxide to clear most of the air from an underground propane storage cavern. Cardox Division of Chemetron Corp. handled the job at Sun Oil's Marcus Hook, Pa., refin-

constructed at Kamloops, from which the line will be operated.

Government role . . . Premier W. A. C. Bennett has what has been described as his own "national oil policy" in British Columbia.

The all-B. C. pipeline was inspired by the premier. His restrictions on a project which authorized Peace River Oil Pipe Line Co., Ltd., to build a line from Peace River fields to a point on Trans-Mountain in nearby Alberta were not acceptable to the owners.

Bennett won agreement from the Vancouver refiners to process any British Columbia oil that was laid down at competitive prices with present Alberta supplies.

British Columbia labor and materials are being used exclusively, where they are available, on the pipeline. The only non-Canadian machinery will be pumping units obtained from the United States.

High Court Refuses TBA Case

• Supreme Court declines to consider lower court's decision barring linkup of TBA sales, station leases. •

THE U. S. Supreme Court refused to consider a lower court ruling barring the tying the sale of tires, batteries and accessories to the lease of service stations and the sale of gasoline.

Action came on an appeal by Sinclair Refining Co. from two decisions of the Fourth Circuit U. S. Court of Appeals.

S. Kriete Osborn, formerly a Sinclair dealer in Maryland, asked the high court to reject Sinclair's appeal.

Much interest . . . The case excited lively interest in oil marketing circles when the appeals court overturned Baltimore U. S. District Court and ruled for the dealer.

The appeals unit said in February 1961:

"We reaffirm our previous holding that the record in this case discloses an unlawful restraint of trade between Sinclair and its dealers generally in Maryland. This restraint consisted of tying the sale of tires, batteries, and accessories to the lease of service stations and the sale of gasoline. If the plaintiff suffered injury as a result of this illegality, he is entitled to recovery."

Damages next . . . Earlier, the court had sent the case back to the District Court for hearings on damages "before as well as after the termination of the lease." Hearings on the damages are expected to be the next step.

Sinclair told the Supreme Court the record was lacking in evidence as to the volume of Sinclair business in Maryland, and that without this, the finding of illegality could not stand. The appeals unit has said Sinclair had more than 10% of the gasoline stations and gasoline sales in the state, which it called "not insignificant."

Sinclair told the high court that "under this decision no trader of any size can safely do business with customers who habitually purchase more than one item from him. If his share of the market for one product is of the order of 10%, he will be presumed to possess leverage."

Osborn replied that "there is no tying problem where two products are offered as a unit at a single price, if the buyer is free to take either product by itself . . . A trader who voluntarily chooses to skate on thin ice has no legitimate complaint if the ice breaks."

The Osborn case dates back to 1956. In that year Sinclair canceled a lease he held in Baltimore (OGJ, June 12, p. 96), and the long legal struggle began when Osborn filed a damage suit.

BRIEFS . . .

ery cavern. The CO_2 forced air out a surface vent. Then propane was injected.

First permits to be issued under Oregon's new law which allows private oil exploration on the state's 600,000-acre tidelands have been awarded to Shell and Gulf. Both firms plan reconnaissance programs soon under terms of the non-exclusive permits.

Phillips Petroleum is expanding its research center near Bartlesville, Okla. Planned for completion next spring is an electro-mechanical laboratories building. It will house workers engaged in instrumentation, automation, and mechanical development and employes in the natural gasoline department's meter shop.

Texas Butadiene & Chemical Corp. will construct a refrigerated terminal near Rotterdam to receive butadiene shipments from its Sheldon, Tex. plant. A contract will be let this summer, and work completed by January. The butadiene will be shipped in the tankers Methane Pioneer and Iridina.

Texas American Oil Corp. has bought working and royalty interests in 29 West Texas oil and gas wells from Mrs. Fred W. Gaarde, Midland, Tex. Involved is 20% working interest in 18 oil and gas wells plus royalty interest in 11 producers. Additional drilling is under way.

Gas for San Antonio will be supplied by Alamo Gas Supply Co., a new firm. The city has awarded the firm a 20-year contract. United Gas Corp. had supplied the city for over 30 years. Coastal States Gas Producing will be Alamo's source of supply. Pipelines triggered by the new contract include 107 miles of 20 and 24-in. delivery lines to be built by Coastal and Alamo. These lines will take gas from Coastal's Lo-Vaca Gas Gathering System, now under construction. Also, Tex-Star Oil & Gas Corp. and Coastal will build a new gathering system to supply Lo-Vaca with gas from Live Oak County wells.

A new heating process uses natural gas to obtain temperatures ranging from 3,000° to 6,000° F. At Arthur D. Little, Inc., laboratories in Cambridge, Mass., high-melting-point metals like tantalum have been melted in demonstrations. Through use of a "booster" burner, electrical energy is superimposed on energy derived from combustion of natural gas or other fuels. Little has finished a program for American Gas Association on new gas uses.

Jet Fleets Growing Faster Than Expected

• Aviation refiners can expect sales to rise 2½ billion gallons per year as commercial airlines replace turboprops, add jets to fleets for short hauls.

THE JET age continues its onrush with the explosiveness of a sonic boom.

Commercial airlines have purchased or ordered $5 billion worth of jet aircraft, according to an annual survey of the aviation department of Esso International, Inc.

The trend is progressing even faster than expected. More than 300 jets were ordered during the 12 months since the previous Esso survey. The latest figures point up two important facts about the conversion from piston to jet-powered aircraft:

. . . The pure jet is overtaking the turboprop, transition craft into the jet age which is entering an evident phase-out period.

. . . Shorter hauls, under pressure of passenger demands, will get jet equipment even as the globe-girdling and continent-spanning routes already have.

All of it adds up to a lot more jet fuel for refiners to produce. And in this generation of subsonic craft, ranging in speed from Mach 0.84 to Mach 0.90+ (Mach 1 is the speed of sound), refiners should have no trouble meeting fuel specifications.

Jet fleet spurts . . . More than 1,000 turbine-powered commercial aircraft are already flying.

Of the total, 480 are pure jets and 714 are turboprops. And almost 600 more are on order, generally due for delivery by 1963 or before, boosting the fleet to 1,765.

The jet fleet existing and planned is broken down this way: 902 pure jets, 845 turboprops, and 18 helicopters. At the present time, turboprops still outnumber pure jets in airline service, but future deliveries will put the pure jet on top.

Of the aircraft to be delivered through 1963 and beyond, 422 are pure jets, amounting to three-quarters of the total. Each four-engine craft of this type adds an estimated 6 million gallons to annual turbine fuel demand. And so these jets will boost demand by about 2½ billion gallons a year.

Short-haul jets, too . . . Almost every airline is joining the jet parade, including even local carriers in a few instances.

Jets are already flying for 103 airlines; 26 more will add jet service soon. Growing passenger preference appears to be forcing jet aircraft on short and medium runs where airlines would rather get more mileage out of piston-powered planes.

But the tide is in favor of the faster, more luxurious planes on all hops. New aircraft sales this year for the first time are dominated by medium and short-medium range jets.

The total in these categories is 490, of which more than 200 were ordered during the past year. The 490 shorter-range craft on order compares with 364 for the long-range jets.

Turbofans popular . . . The turbofan-powered jet, with its advantages in thrust, speed, range, and fuel consumption, rose to prominence during the past year.

More than 300 jets in service and on order already have a turbofan or bypass engine, or will have when delivered. One major airline is converting its entire jet fleet to fan-type jet engines.

Gas-Export Permits Granted

. . . for Alberta's sprawling Medicine Hat field. Action paves way for big-scale export outlets for first time.

THE WAY has been cleared for Medicine Hat, one of Canada's biggest gas fields, to obtain major export outlets for the first time.

Two producer groups have been authorized by the Alberta Oil and Gas Conservation Board to export 133 billion cubic feet of their reserves in the field over a 25-year period.

The Bailey Selburn Oil & Gas, Ltd., group may remove 71 billion cubic feet. Consolidated Mic Mac Oils, Ltd., was authorized to remove 62 billion cubic feet.

In each case, the volume amounts to 75% of the company's reserves in the field.

Both applicants have indicated that Trans-Canada Pipe Lines, Ltd., will negotiate for the gas. But they have no contracts with the company.

The Conservation Board stipulated that the two groups must show before June 1, 1962, that arrangements have been made for selling the gas in an extraprovincial market or to a company supplying a market outside the province.

Applications of the groups were unusual because gas-export requests have been made by pipeline companies in the past.

Another unusual angle: It has not been the board's custom to grant

PROCESSING

An anhydrous ammonia terminal with capacity of 15,000 tons will be built by American Oil at Joliet, Ill. Site is next to Amoco Chemical's plant on the Des Plaines River. The terminal will enable the company to receive, store, and reship ammonia by rail, water, or truck on a 24-hour basis.

American Oil will build a 70,000-bbl.-per-day crude distillation unit and cooling tower at its Sugar Creek, Mo., refinery. It will be completed by July 1, 1962. The refinery expects to increase current capacity of 970,000 bbl. of asphalt a year by nearly 50%.

A $2,000,000 research center at Houston is planned by United Carbon Co. Completion is set for next spring. United will transfer some

export permits to companies without firm gas-sales contracts.

Field's history . . . The Medicine Hat field is the largest proved gas area in western Canada. It covers about 180 sq. miles.

Despite its size, the principal function of the field has been to serve the towns of Medicine Hat and Redcliff. Some gas has been sold to Saskatchewan Power Corp.

The city of Medicine Hat resisted granting of the producer permits. It wanted to hold the reserves for its own use.

Original reserves of the field, which was discovered in 1904, were figured at 1.5 trillion cubic feet.

Altogether, 160 producing gas wells have been drilled. Cumulative production up to the first of this year totaled 230 billion cubic feet.

Since estimated remaining reserves are computed at 1.27 trillion cubic feet, the field has produced only about one-sixth of its reserves.

At one time the city of Medicine Hat owned all of the producing wells in the field. Many of the early wells were inside the city limits.

Later, private wells were drilled.

The Conservation Board's decision gives the city of Medicine Hat and others in the area the opportunity to contract for some of the reserves of the Bailey Selburn and Consolidated Mic Mac groups.

Texas Flow Held to 8 Days

TEXAS is keeping an 8-day oil production pattern for the third straight month.

July output will be 2,629,959 bbl. daily, a decrease of 47,901 bbl. daily from the initial allowable for June.

Because stocks are about 13 million barrels above desired level, eight of the 13 major oil purchasers asked the Railroad Commission for only 8 days of production. They were Sinclair, Mobil, Shell, Indiana Oil Purchasing, Cities Service, Standard of Texas, Texaco, and Humble.

Continental, Phillips, and Gulf asked for 7 days. Sun and Atlantic sought 9. The only independent who spoke asked for 8 days.

Crude Runs to Stills Rise Slightly in May

Company—	Avg. in bbl. daily*	% of Capacity
Petrofina	23,999	80.0
Atlantic Ref.	185,589	88.3
Bell	6,123	76.5
Bryson Pipe Line	519	47.0
Cities Service	237,237	81.0
Continental	171,689	88.9
Cosden	35,867	83.4
Crown Central	35,388	88.5
Danaho Refining	3,921	32.6
El Paso Natural	20,492	93.1
Gulf	452,395	80.3
Humble	806,000	83.8
Indiana Oil	626,000	87.0
LaGloria	13,686	57.0
Monarch	2,401	60.0
Ohio	70,164	63.5
Permian	3,295	82.4
Phillips	215,300	78.5
Plymouth	35,305	78.4
Premier	15,104	67.0
Pure	163,806	87.6
Rado Refining	768	51.0
Shamrock	24,089	89.2
Shell	552,127	93.0
Signal	54,224	90.3
Sinclair	394,150	80.6
Skelly	51,880	95.0
Socony Mobil	610,000	85.1
Sohio	139,968	82.1
Standard (Tex.)	49,660	66.2
Sun	197,960	77.6
Suntide	38,789	59.7
Texaco	627,080	84.9
Tidewater	252,645	91.9
Wickett	983	28.0
Others	1,545	61.8
May Total	6,120,148	
April Total	5,944,383	

*As reported to Texas Railroad Commission.

BRIEFS . . .

scientists to the facility from research labs in Aransas Pass, Borger, and Baytown, Tex.

Styrene capacity at Shell Chemical's Torrance, Calif., plant has been raised to 17.5 million from 15 million pounds a month. Additions to the steam plant have increased capacity to 775,000 lb. per hour.

Tetraethyl lead prices are now at their lowest in the past 10 years, following a 5% cut by Ethyl Corp. and Du Pont's petroleum chemicals division. On the basis of the lead alkyl content, price of TEL motor mix is 55.61 cents per pound and the aviation mix, 59.61 cents. Tetramethyl lead was reduced to 85.49 cents. Various TEL-TML mixes were also cut about 5%.

First Canadian Hydeal unit has been started up by Canadian Oil Companies Ltd., at its Sarnia, Ont., refinery. The 350-bbl. unit, designed and licensed by UOP, produces nitrogen-grade benzene from toluene.

A **combination** hydrogen-treating and reforming unit has been put on stream at St. Boniface, Man., by North Star Oil Ltd. The 2,700-bbl. installation uses UOP's Unifining-Platforming processes.

A $2,000,000 gas plant will be built near McGregor, N. D., by H. L. Hunt interests. It will have a 12,000-M.c.f.d. capacity and will process gas from North Tioga and nearby fields. Plans are to sell to Montana-Dakota Utilities.

A 7,000-bbl. UOP Udex unit has been put on stream at British American's Montreal refinery. Benzene from the unit will be used to produce cumene, while the C_7-C_8 aromatics will be blended into premium motor fuel.

Also for Refiners . . .

IN THE NEWS: What the maritime strike will mean to oil (p. 115) . . . West Coast resid market has regained some of its old vigor (p. 122) . . . Jet air fleets are growing faster than expected (p. 130) . . . American Independent Oil will build refinery in Rhodesia (p. 136).

PLUS THESE TECHNICAL REPORTS: New solid catalyst is heart of Pure's butane isomerization process (p. 164) . . . Record shows committee action can reduce refinery accident rate (p. 178).

Humble stakes a claim:

In Kentucky's Area, Who is Esso?

WHO is actually entitled to the Esso brand name in the Standard Oil Co. (Ky.) five-state marketing area?

That's the question posed in a Jackson, Miss., federal court by Humble Oil & Refining Co.

Humble is asking the court to issue a decree granting it the right to market Esso products in Standard of Kentucky (Kyso) territory. It is asking also that Kyso be prohibited from using the trademark except under terms of three agreements made by Kyso and Standard Oil Co. (N. J.) companies.

One industry source says the agreements give Humble the right to cancel them upon proper notice.

The suit arises from the proposed merger of Kyso into Standard Oil Co. of California (OGJ, June 12, p. 81 and June 19, p. 64). In a consent decree approving the merger and settling an antitrust action against Kyso, the Justice Department said the merger would stimulate competition between Standard of California and Standard of New Jersey, Humble's parent.

The issue which emerged from the decree is this: Kentucky Standard has been marketing Esso-branded products—but not gasoline—for many years. The name is well known in Kyso's 5-state area. Now that Kyso will be joining forces with Socal, Humble wants to invade this market on its own. And it wants to use the Esso brand name.

Humble has forced the issue. It has opened stations in five Mississippi cities flying the Esso oval, and simultaneously it went into court to forestall a possible Kyso lawsuit that might prevent such expansion.

According to Humble's complaint at Jackson, "Defendant (Kyso) has threatened plaintiff that, if plaintiff were to sell any Esso products in any of the said states, defendant would be obliged to and would institute suite against plaintiff."

Standard of Kentucky has until July 5 to file a response and will do so, its attorneys say.

Background . . . The Humble lawsuit raises questions involving the 1911 court decree which dissolved the Standard Oil Trust.

Kentucky Standard, a marketing company, has held rights to the brand name "Standard" in its five-state territory, but whether the rights to all Standard Oil name derivatives carry over to a merger, such as that with Socal, apparently is unsettled in the current case. Since the Esso name has been used in the area with Kyso's approval, Humble believes it can continue to use the name as its own marketer, while Kyso cannot.

The first of Jersey's three agreements with Kyso was made in 1934 by Penola, Inc., a Jersey company. It permitted Kyso to distribute Penola products under Penola's trademarks, including Essomarine. The agreement, according to Humble's lawsuit, retained with Penola all rights to the trademark.

The second agreement was made by Standard Oil Co. (N. J.), with Kyso in 1938 and permitted Kyso to use the trademark Essotane in selling commercial propane.

In 1955 the third agreement was reached whereby Kyso was given permission to use the trademark Esso and other Esso-connected trademarks in marketing products of Esso Standard Oil Co. As in the other cases, Humble said Kyso agreed that it gained no ownership of the trademarks.

Perez Alfonzo, U. S. Officials Confer

DR. JUAN Pablo Perez Alfonzo, Venezuela's Minister of Mines and Hydrocarbons, talked oil last week with top U. S. officials in Washington, but no one was telling the results.

It is understood Perez Alfonzo laid out his nation's views on the U. S. oil import program and that he was promised the ideas would be considered.

The minister called on Edwin M. Martin, Assistant Secretary of State for Economic Affairs, and Interior Secretary Stewart L. Udall. He was a guest of U. S. senators at a Capitol luncheon.

Interior said a "wide range of petroleum-related topics" came up in the minister's talks with Udall and Assistant Secretary of Interior John M. Kelly.

It is known that Perez Alfonzo would like the U. S. to:

. . . **Assign a quota** for Venezuelan oil under the import program.

. . . **Allow residual oil** exports from Venezuela to the U. S. in good volume.

. . . **End the system** of trading or exchanging oil import quotas. He says this has hurt world prices.

. . . **Consult** other oil-producing nations before setting import quotas.

The Venezuelan minister left with U. S. officials figures showing the spread between U. S. and Venezuelan crude-oil prices at the wellhead has grown from 42 cents a

PIPELINE

Pipe laying on the 433-mile Glacier Pipe Line system has been completed. The line will start operating soon with temporary stations. Permanent stations will be installed in the next 60 to 90 days. Stock in the line is owned 50% each by Continental and Texaco. It runs from Cut Bank, Mont., via Billings to Byron, Wyo., where it ties in with the Platte Pipe Line system. Initial capacity will be 50,000 bbl. per day.

Four companies have combined to form British Columbia Oil Transmission Co. The company is planning a pipeline from the Blueberry field to Taylor in northern British Columbia. The 75-mile line would have a capacity of 15,000 bbl. per day and would cost $8,000,000. The four companies, Sun, Fargo

barrel in 1950 to 74 cents in 1960.

The figures showed U. S. prices at $2.51 a barrel in 1950, rising to $2.92 in 1960.

Venezuelan prices were $2.09 a barrel in 1950 and $2.18 in 1960.

On the basis of 223 million barrels exported to the United States in 1950, Venezuela lost $94 million in the U. S.-Venezuelan oil trade, the chart indicates. For 1960 with exports to the United States at 423 million barrels, the figure is $313 million.

Humble Cuts Crude Price

HUMBLE Oil & Refining Co. has reduced its posted price for crude in 35 western Mississippi fields by an average of 10 cents per barrel.

Humble is the sole purchaser in the fields and takes about 41,000 bbl. daily from them for its Baton Rouge refinery. The company said the cut was made to bring the crude "into line with other competitive crudes available."

The price on some 30,000 to 35,000 bbl. daily was reduced by 10 cents and smaller amounts were reduced by 5 cents and 15 cents. While prices vary by fields, much of it has been selling at $3.25 for 40°-gravity, and this was dropped to $3.15. The 2-cent differential per degree of gravity was retained.

Pembina Flood Must Continue

• Alberta Board rejects Mobil application to substitute water flooding for miscible in three field units.

ALBERTA'S Oil and Gas Conservation Board has rejected Mobil Oil of Canada's request to substitute water flooding for miscible-phase recovery in three areas of Pembina field.

Mobil made the application on behalf of participants in North Pembina Cardium unit No. 1 because of changed economics, including a drop in maximum permissible rate (MPR) advantages. Another consideration was that the liquefied-petroleum-gas supply is "doubtful."

The board said the proposed substitution would result in waste of recoverable oil.

However, the board raised the miscible MPR in areas M-1 and M-2 from 2,200 bbl. a day to 2,400 bbl. for the period from July 1 to October 31. Miscible wells will be allowed 75 bbl. daily per 80 acres, compared with 69 bbl. previously.

The board extended until September 1 the deadline for miscible injections to start in the three areas (M-3, M-4, M-5) where Mobil wanted to switch to water flood. The old deadline for injection was July 1.

About 13,000 acres are in the five miscible-flood programs.

When the program started in 1959 as the world's largest miscible flood, it was estimated 708 million barrels of oil were in place. Recovery without pressure maintenance was estimated at 16%. Miscible flooding was expected to recover 152 million barrels, and water flooding 182 million barrels—a production increase of about 50%.

Mobil said recovery predictions have not changed and the company believes it can control miscible flooding. In asking for the substitution of recovery methods, the company cited the board's action on January 24 which cut the M-1 and M-2 MPR from 85 bbl. daily per 80 acres to 69 bbl. daily. Water flooding MPR has been unchanged at 60 bbl. daily per 80 acres.

"From the events listed, it became evident that the drop in both the incremental MPR advantage to miscible flooding over water flooding and the level of both MPR's sufficiently changed the original rate time prediction so as to seriously affect the economics," Mobil said.

BRIEFS . . .

Oils, Western Natural Gas, and General American, are principal producers in Blueberry. The line initially will handle 5,000 bbl. of oil and 1,000 bbl. of condensate.

Construction applications pending before FPC dropped in May. Nineteen were filed and 21 disposed of that month. The number on file as of May 31 totaled 197 with a value of $872,451,041, compared to 199 with a value of $876,873,634 a month earlier. Still pending are applications covering 7,157 miles of pipeline and 658,468 hp. in compressor stations.

Laying of 71 miles of line between Worthington and Indianapolis, Ind., will be done by Williams Brothers for Citizens Gas & Coke Utility. The project consists of 58.44 miles of 20-in., 7.77 miles of 16-in. and 4.46 miles of 12-in. Construction will begin in late June.

Northern Alberta's Worsley gas field will be tied to the West Coast Transmission system under a proposal made by Alberta Gas Trunk Line to build a 40.8-mile, 12 to 16-in. connecting line. West Coast has asked that Worsley be included in its export permit. Construction would begin following approval by Alberta's Oil and Gas Conservation Board. The line will deliver an average of 55,000 M.c.f.d. initially. Reserves are estimated conservatively at 185 billion cubic feet.

Extension of Northern Natural's system from Menominee, Ill., to Janesville, Wis., will be made by Panama Inc. The extension is an 82-mile 20-in. line.

Also for Pipeliners . . .

IN THE NEWS: Plans for Suwanee products line may get off the ground in a few weeks (p. 117) . . . Peace River Oil Pipe Line will link system with eastern outlets (p. 117) . . . Coal interests say controversial Senate gas bill is too weak (p. 121) . . . Dixie LPG line construction begins next month (p. 124) . . . Gas export permits granted in Canada's Medicine Hat field (p. 130).

PLUS THIS TECHNICAL REPORT: Special Journal section on pipeline costs for installation and equipment (p. 139).

Soviet Aid May Be Greater Menace Than

Paul Swain
International Editor

A 6-MAN TEAM of top Russian exploration people were in Karachi last week to sign detailed contracts for a $35-million Soviet-financed and Soviet-directed search for oil in Pakistan.

The new Pakistani agreement isn't remarkable. Such agreements are becoming almost commonplace. They are part of a pattern that could be more dangerous than cheap Russian oil.

The deal was first made last March by Z. A. Bhutto, Pakistani Minister for Fuel, Power, and Natural Resources after he was given a royal tour of the Caucasus, topped off by a Moscow dinner with Nikita Khrushchev as host.

It calls for Pakistan to repay the $35 million in credits, 75% of it in equipment, over a 17-year period at "very low interest." Russia will supply exploration experts to use the equipment and train Pakistanis to look for oil.

Western oil people have debated for months about Russian motives in continually undercutting prices in the world's crude markets.

There are those who insist the Russians are using oil as a purely political weapon. Others say the Soviets are pushing oil to get badly needed hard currencies to buy what they can't produce. A third group believes there is part of each motive in every deal the Soviets make.

There's no question about the motive behind the Pakistan deal. It is purely political. It is only the latest in a series of similar "aid" projects in the world's underdeveloped countries.

The Russian "we-don't-want-your-oil, but-we'll-help-you-find-it" approach has a pleasing sound in a great many areas of the world where people have been sold the idea that western oil companies are "exploiters." It works even better in countries like Pakistan and India where the private western companies have not been too successful in finding crude for the oil-hungry nations.

In the long run the Russian approach on "aid" may be far more dangerous to the oil industry as we know it today than any mass invasion of Soviet crude oil. It is not being confined to exploration. The Russians are moving into refining and petrochemicals almost as strongly.

Here's how the approach is working in various countries:

1. In Pakistan

Pakistan was particularly ripe for the kind of a deal the Russians have made.

Eight western oil companies, British and American, have poured millions into exploration for oil in the country with a notable lack of success.

One American company, Hunt International, pulled out of Pakistan 2 years ago after drilling 11 dry holes and participating in 2 more.

British companies which for years have produced less than 8,000 bbl. daily from the country's small, old oil fields, have made spectacular natural-gas discoveries. Reserves of West Pakistan's big Sui gas field are estimated at 9 trillion cubic feet or the equivalent of 1.5 billion barrels of oil.

But it's gas and not oil.

The Pakistanis, with British help, are making use of the gas as rapidly as possible. However, in a country with very little industry, gas is a more inflexible fuel than oil. The Pakistanis want oil, too. They care very little about who finds it for them.

One other factor makes a Russian-type deal attractive to Pakistan. If the Soviets do succeed in finding oil there, it will be Pakistani oil. Under the concession granted the western companies, the Pakistanis have a 25% interest in the operations.

The caliber of the Russians sent to Karachi to negotiate the final details of the agreement is a fair indication of the importance Moscow attaches to the deal.

The delegation is headed by S. S. Bordachev, vice president of Techno-Export, and includes A. V. Forin, chief geologist of the USSR Ministry of Geology; A. A. Scharider, the ministry's chief geophysicist; M. I. Kuzin,, a production engineer; and V. V. Martynov and Mrs. L. A. Ochinnikov, both of Techno-Export.

The talks now going on in Karachi deal with what equipment the Russians will ship to Pakistan, how much, and when.

Maj. Gen. M. Hayauddin, director general of Pakistan's Bureau of Mineral Resources, says he expects the first equipment and Russian technicians to begin arriving in Pak-

Cheap Crude

istan by September. He doesn't expect actual drilling operations to start for at least 2 years.

2. In India

The so-called neutralist and definitely socialist regime of Jawaharlal Nehru made India a natural as the opening wedge for the Soviets in a program to "aid" backward nations which wanted to find and process oil.

In contrast to the generally pro-western Pakistan, India probably would have welcomed the Russians with open arms even if private oil companies had been successful.

Like Pakistan, India has been a have-not oil nation and carries a heavy burden of foreign exchange needed to buy the oil it uses. The British companies which found meager oil supplies in the Digboi region of remote Upper Assam and have produced them since before the turn of the century, have succeeded in adding greatly to those oil reserves.

An intensive deep-drilling program in the Nahorkatiya-Moran region has established reserves that will produce 60,000 bbl. daily. This oil will go into Russian-built refineries owned by India.

To get additional areas in which to look for more reserves the operating company, Oil India Private, Ltd.—a subsidiary of Burmah Oil Co.—recently had to give the government a full half interest in its whole Indian operation (OGJ, June 12, p. 103).

American companies have poured millions of dollars into exploration efforts in India without any success. This has nurtured the myth in India that western companies don't want to find oil because they would rather depend on Middle East holdings to supply the Indian market.

The Russians walked gleefully into this situation, offering long-term low-interest credits and technical help in an effort to help the Indians find their own oil.

The Russian-Romanian effort apparently has been successful. The extent of the oil found so far by Russian rigs and crews, drilling with a few trained Indian personnel, is difficult to assess. Everything that comes out of India regarding the program is clouded.

Apparent success of the "public sector" effort on India's part has prompted the government to set up a $44-million budget for the 1961-62 period to increase its own oil finds. The country could never bear the burden of such a cash outlay without the help of $52 million in credits offered by the Russians.

The Russian-Romanian rigs and crews apparently have found sizable reserves in the Cambay-Ankleshwar region of India about 300 miles north of Bombay. At Cambay at least a dozen of the wells have been completed as commercial. At Ankleshwar, about 100 miles to the south, at least eight producers have been drilled.

Neither of the fields has been produced because there are no pipeline outlets.

India is now making plans to move at least a part of the initial output of these fields by rail to the Bombay area, where private refineries are operated by western companies.

The government of India hasn't completely frozen out private oil companies, but the heavy emphasis is aimed at making use of Russian help and financing. Western companies have to give terms most of them regard as highly unsuitable. In contrast, the Russians offer help and money for long periods at low interest.

Indian refineries . . . The Russians and Romanians teamed up to build two refineries in Assam to process the British-discovered Nahorkatiya crude.

The smaller plant, a 15,000-bbl. refinery, is being built by Romanians with Romanian equipment at Nunmati. The $30-million cost of the plant will be repaid by India over a 7-year period at 2.5% interest.

In some last-minute dickering, P. R. Nayak, general manager of the government-owned Indian Refineries, Ltd., got the Russians to shave the over-all cost of the Barauni, Bihar, refinery from $82 to $78 million.

The first 20,000-bbl. daily unit of this plant is slated to go on stream by October of next year with another 20,000 bbl. daily to be added by April 1963. A lube plant

RIG IN INDIA supplied under the communist aid program is well-labeled to make sure that all possible credit will go to the satellite country.

with an annual capacity of 50,000 tons will be built at Barauni instead of other units originally planned for the refinery.

A third refinery, designed to process 40,000 bbl. daily of Cambay-Ankleshwar crude, is now being planned for Gujarat. The Russians have told India they can build this one for $60 million because it is to be a straight topping plant.

3. In Iraq

The first Soviet foot in the middle eastern doorway was revealed just a few weeks ago.

The Iraqi ministry of oil decided to buy a heavy Russian rig for use at a wildcat in the Jarabika area near Khanaqin in a part of the oil concession given up in 1959 by a British Petroleum Co. subsidiary.

Soviet seismic teams have already made an extensive survey of the region which is now being operated by the Iraqis. The Russians have told the Iraqis the area has recoverable reserves ranging between 105,000,000 and 140,000,000 bbl.

The Iraqis are now producing about 4,000 bbl. daily from the former British properties.

An Iraqi-Czechoslovak economic and technical cooperation agreement, effective in February, calls for the Czechs to build a refinery of still unspecified size at Basrah, plus two petrochemical plants.

4. In the UAR

In spite of the fact that Gamal Abdel Nasser has grown noticeably less enthusiastic about his ties with the Russians, the communists are active in oil in both Egyptian and Syrian regions.

Less than 2 years ago Czechoslovakians built a 20,000-bbl. daily refinery at Homs, Syria, at a cost of about $16 million. The plant is still only running at about 75% capacity because of limited demand within Syria.

At Karachuk, the oil field found by an American independent 5 years ago and then taken over by the government, three heavy Soviet rigs are at work. An additional 30 Soviet drillers arrived in Damascus early this month.

Karachuk, near the Iraqi border, was discovered in 1955 by J. W. Men Hall, American independent. The UAR took over his operation because they said he was not drilling on a wide enough area. The government now hopes to build a 500-mile pipeline to the sea coast and open the field at a daily rate of 40,000 bbl. by 1964.

In the Egyptian region of the UAR, three Russian rigs are at work in areas under the control of the government-owned General Petroleum Authority.

The latest to arrive in the country is rated for depths below 16,000 ft. and will drill a wildcat at Jebel al Zait near Cairo. The other two, both 10,000-ft. rigs, are slated for wildcatting in other areas.

There are other areas, too. Soviet equipment is being sold in Latin America wherever the Russians can barter their oil tools for raw materials which they can use. There will almost certainly be more such deals. The Soviet pattern is pretty clear. Africa with its newly independent nations will probably come next.

The Soviet theme of "we don't want your oil but we'll help you find it for yourself" is a siren's song to a poor nation looking for oil riches.

Russians Strike Oil in India

INDIA has made another oil find with the help of Russian drillers.

The latest strike by the country's Oil & Natural Gas Commission is at Kalol, in Gujarat State, where Cambay and Ankleshwar oil fields are located.

The initial Kalol well, 15 miles from Ahmedabad, in western India, indicates a find that may be comparable to Cambay or Ankleshwar, according to K. D. Malaviya, Minister for Mines.

Kalol 1 originally was projected to 2,000 meters—about 6,560 ft., but was bottomed at 5,250 ft. because of oil and gas shows and high pressure.

The well now is flowing low-sulfur oil after perforations at 4,660 ft.

The find is another feather in the cap of Russia, which is giving a high priority to exploration aid to the world's under-developed countries under a "We don't want your oil, but we'll help you find it" approach.

But Kalol may also mean more business for drilling contractors from Western countries. The Oil & Natural Gas Commission wants to keep 10 rigs running at both Cambay and Ankleshwar, and another three at Kalol. In the face of limited drilling equipment on hand, it is considering an invitation of tenders from foreign contractors.

Drilling at Cambay indicates the field may have a better gas than oil potential, and the government has temporarily shelved plans to import gas from Sui or Mari fields in West Pakistan.

Several early Cambay wells were completed in the 300 to 500-bbl.-daily class. The Ankleshwar find was an indicated 2,100-bbl.-daily well. But details on later wells have not been disclosed.

Aminoil to Refine, Market in Rhodesia

AMERICAN Independent Oil Co. will build a $36.4 million refinery in southern Rhodesia within 2½ years.

Frank Owen, Minister of Commerce and Industry for the Rhodesian federal Government, said the plant will be built between Salisbury and Umtali.

The refinery will be part of an over-all $84 million investment that will include a pipeline from Beira, Mozambique, on the coast of the Indian Ocean, a nitrogenous fertilizer plant, and a petrochemical industry.

The Minister said Aminoil agreed to bring established gasoline marketers into the plan, and that financial participation by other distributors was arranged for in negotiations between Aminoil and Shell, which represented other firms.

Owen negotiated the $84 million package with R. S. Steinbok, described as an international entrepreneur.

Total product demand in the federation, which includes northern and southern Rhodesia and Nyasaland, is about 11,000 bbl. daily.

YOU SAVE WHEN YOU DO BUSINESS WITH

CONTINENTAL-EMSCO

it takes GUTS to drill today!

It takes *guts* in slush pumps, too. That's why Continental-Emsco builds this power end to take emergency loads in stride.

Continental-Emsco *stabilized* slush pump design *ten years ago* with its Fabriform construction! And ever since, Continental pumps have set an unequalled record for long life. This is verified by the few spare parts being ordered as compared to the number and age of pumps now running.

Continental slush-pump design reflects years of performance under all kinds of drilling conditions . . shallow to great depths . . light to heavy mud loads . . slow and fast rotating speeds . . light to heavy drill collar loads.

If you want real back-up for your courage to face today's tough drilling contracts, call a Continental man and talk slush pumps.

CONTINENTAL-EMSCO

Serving the Oil and Gas Industries . . Worldwide

SP 102

CONTINENTAL-EMSCO COMPANY, a Division of The Youngstown Sheet and Tube Company, General Offices: Dallas, Texas; Export Division: 30 Rockefeller Plaza, New York, N. Y. • Continental-Emsco Company Limited, General Offices: Calgary, Alberta, Canada Continental-Emsco Company C. A., Caracas, Venezuela • Plants: Houston and Garland, Texas; St. Albans, Herts, England • *Representatives in All Principal Oil Fields of the World*

Drilling Abroad Holds High Pace

FOREIGN drilling is perking along at a high level with more than 800 rotaries making new hole on wildcat and field wells.

A Journal survey shows that 834 outfits are active outside of the U. S. and Canada, which is 20 less than a year ago but 18 above the December level.

U. S. operators had 1,823 rotaries in operation on new wells early in June. Another 144 were in action in Canada, bringing the free-world total to 2,801.

	JUNE 1961	DEC. 1960	JUNE 1960
LATIN AMERICA			
Argentina	109	109	106
Bolivia	14	15	10
Brazil	55	39	48
British Honduras	1	...	...
Colombia	17	18	19
Chile	4	4	4
Costa Rica	...	1	...
Cuba	...	1	1
Dominican Republic	1	1	1
Ecuador	7	3	3
Guatemala	1	...	1
Mexico	144	134	134
Panama	1	...	...
Peru	11	11	11
Trinidad	25	25	28
Venezuela	29	40	42
Total	419	401	408
MIDDLE EAST			
Bahrain	1	1	...
Iran	13	14	16
Iraq	7	11	11
Israel	4	4	6
Jordan	...	1	...
Kuwait	...	2	2
Neutral Zone	6	6	6
Qatar	1	2	2
Saudi Arabia	2	3	3
South Arabia	2	2	3
Syria	2	2	2
Turkey	11	11	11
Total	49	59	62
WESTERN EUROPE			
Austria	9	9	9
France	26	34	50
W. Germany	100	100	100
Greece	1	...	...
Italy	31	31	31
Netherlands	4	4	4
Spain	7	6	8
Switzerland	1	1	1
U. K.	4	4	4
Total	183	189	207
AFRICA			
Algeria	45	42	53
Angola	3	3	3
Egypt	18	11	11
Senegal	4	1	3
Gabon	2	2	6
Gambia	1	1	1
Libya	36	35	32
Madagascar	1	1	2
Middle Congo	1	1	1
Morocco	1	1	1
Nigeria	3	5	5
Spanish Sahara	1	1	...
Somalia	2	2	2
Kenya	1	...	...
Tunisia	1	1	1
Total	120	107	121
ASIA-PACIFIC			
Australia	5	4	4
British Borneo	2	2	2
Burma	4	3	3
Formosa	1	1	1
India	17	8	6
Indonesia	12	15	15
Japan	15	15	15
New Guinea (inc. Papua)	...	1	1
New Zealand	2	2	1
Pakistan	3	5	5
Philippines	1	3	2
Timor	1	1	1
Total	63	60	56
GRAND TOTAL	**834**	**816**	**854**

Note: Estimates are made where complete up-to-date reports are lacking.

German Cities Plan 200-Mile Gas Line

CONSTRUCTION of a 200-mile gas pipeline from Mannheim to Ulm via Kiel has been proposed by six cities and two public utilities in Baden and Wurttemberg, Southwest Germany. It would cost $20,000,000 and would be completed in 1963.

Initially the line would handle gas from refineries under construction at Karlsruhe and Strasbourg and from the Saar coke plants. Later supplies would be obtained from refineries planned for Ingolstadt and from Bavarian gas fields. Ultimately it is planned to tie in with a system utilizing Sahara gas.

One of the plans under consideration is a line across France and then across the Mediterranean Sea. However, there has been no decision on the feasibility of such a project.

Cities involved are Stuttgart, Pforzheim, Reutlingen, Ulm, Baden-Baden and Goppingen. The utilities are Gas und Wasserwerke Rhein-Neckar AG of Mannheim and Suedwestdeutsche Ferngas AG of Stuttgart. They have formed Gasversorgung Sueddeutschland GmbH, the South German Gas Supply Ltd., with headquarters in Stuttgart.

Application for a permit to build the line has been made to the Ministry of Economics of Baden-Wurttemberg. Initial capital of the company is $250,000. If approval is forthcoming, the members propose to put up $10,000,000 and raise the balance through the sale of stock.

Future plans call for an extension of the line from Kiel south to Frieburg. This 40-mile line would cost about $4,000,000.

Bolivian Discovery Tested

CHACO PETROLEUM and its partners have tested a Bolivian discovery at the rate of 6,000 M.c.f. daily.

The well, Algarrobilla 1, 40 miles north of the Argentine border, had the flow from an 11-ft. perforation between 3,389-3,400 ft. Light, 57.8°-gravity oil was produced with the gas at the rate of 175 bbl. daily. Total depth of the well is 12,890 ft.

Chaco is a Tennessee Gas Transmission subsidiary.

4th ANNUAL STUDY OF

PIPELINE INSTALLATION AND EQUIPMENT COSTS

By John P. O'Donnell

PIPELINING is big business—combined assets of interstate oil and gas pipeline companies stood at $12.5 billion at the end of 1959. They have gone well above $13 billion since.

Since 1953, oil pipelines have increased efficiency, as measured by productivity per employe, more than 50%. Despite that vast improvement, their return per unit of volume has not changed.

Net income of gas pipelines has been rising steadily but at a slower rate than their investment. The result has been a slow but steady erosion of their rate of return.

These trends explain why pipeline companies are becoming increasingly cost conscious. Tables in this special section review many of these costs as they apply to construction:

Current pipeline costs; Completed compressor station costs; Yearly changes in pipeline costs; Estimated current compressor-station costs; Variations in compressor station costs; Individual pipeline project.

Many variables affect construction costs

Pipeline economics differ from other forms of transport and between and within types of lines. Pipe-laying costs have varied up to 1,000%; station costs have varied 375%

TRANSPORTATION of hydrocarbons, in both the liquid and gas states, has been a growth industry for years. And it will continue to be a growth industry in the foreseeable future.

One reason is that the energy needs of the country are growing rapidly. Liquid and gaseous hydrocarbons now, and will continue to, supply most of this demand.

Another reason is that no form of overland transportation can compete with pipelines in the economic movement of these hydrocarbons.

Pipeline construction is going on at a record or near-record pace all over the world. Every continent is in the throes of major projects and dozens of others are on the planning boards.

In the United States, unlike the rest of the world, the transportation of oil and gas by pipelines is relatively mature. And, like all mature industries, especially those operating in an inflationary atmosphere, more and more attention must be paid to costs.

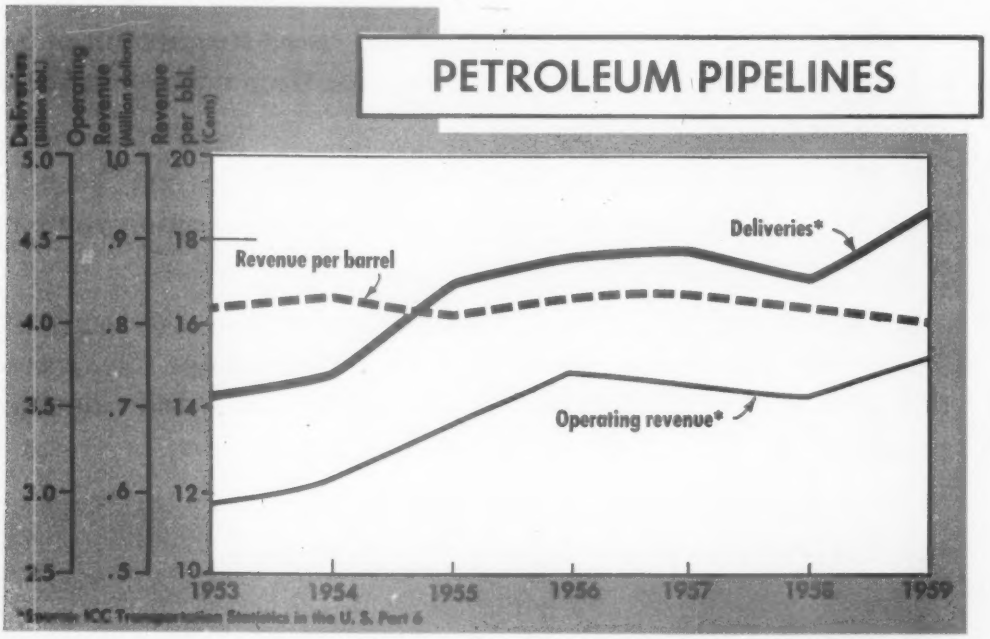
Annual addition. Every year about 12,000 miles is added to the interstate pipeline system in the United States. At the end of 1959, these lines totaled 375,000 miles. By the end of this year they should reach 400,000 miles. This is supplemented by thousands of miles of intrastate lines.

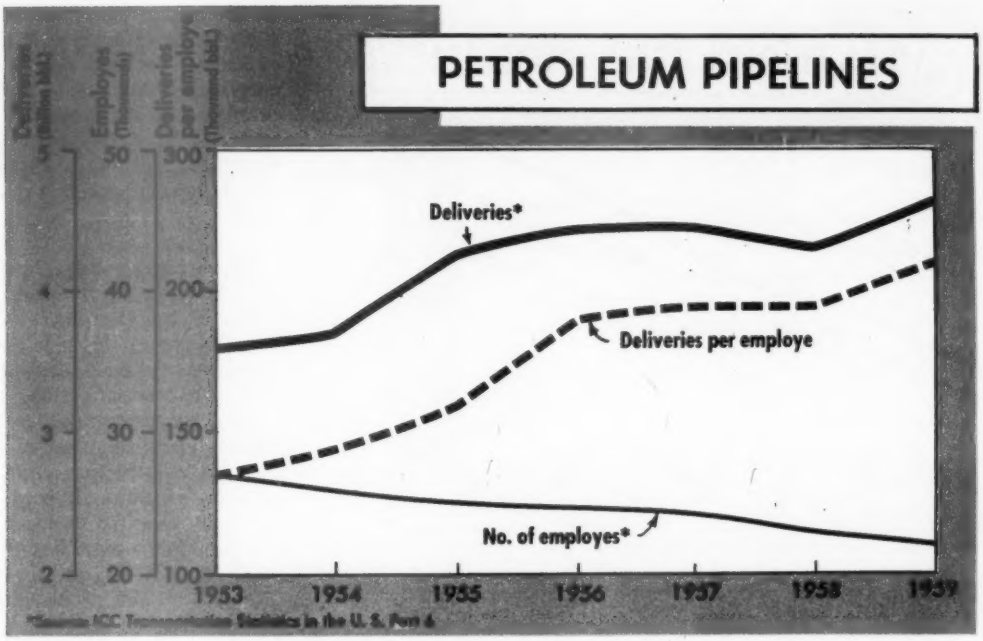
Gas pipelines have led the growth in recent years. From the end of 1954 through 1959, interstate gas lines added about 50,000 miles while interstate oil lines added about 10,000 miles.

At the moment the greatest rate of growth is in LPG lines. Several major and many short LPG lines are building or planned. In addition, many existing lines, both crude-oil and refined-products, are being or have been converted to LPG service.

Oil pipelines have waged a so-far

PETROLEUM-PIPELINE REVENUES, per barrel of oil delivered, are virtually unchanged in past decade. Increases in deliveries, revenues are parallel. Fig. 1.





EFFICIENCY OF PETROLEUM PIPELINE operations, as measured by productivity of employes, has increased 50%. Delivery rate is up, number of employes down. Fig. 2.

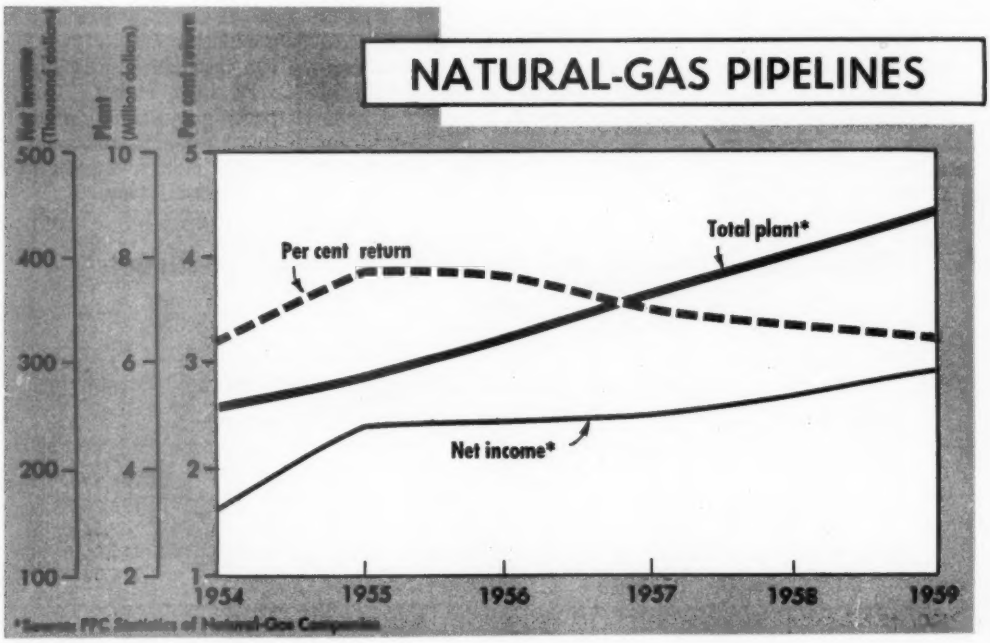
successful battle against increasing costs.

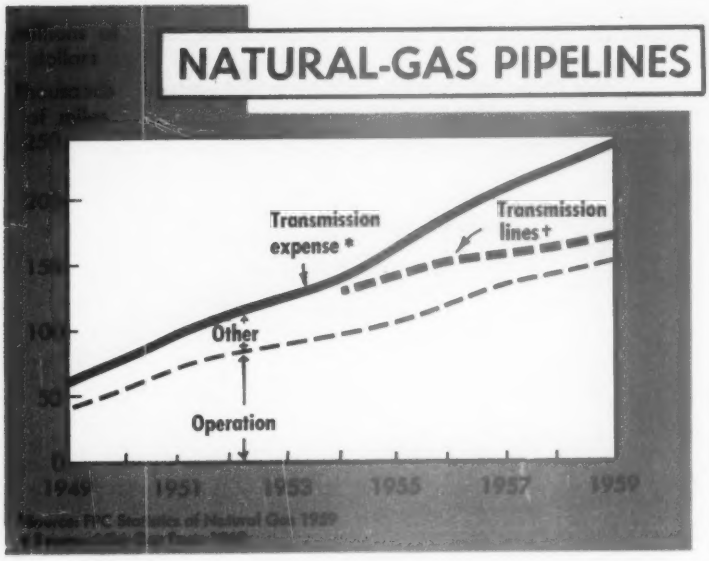
Rates maintained. Success of oil pipelines in holding rates is shown in Fig. 1. In 1953, they delivered 3.6 billion barrels of crude oil and products and took in $591,000,000 in operating revenue. That was an average of 16.3 cents per barrel.

In 1959 these lines delivered 4.7 billion barrels and took in $765,000,000. That was an average of 16.4 cents per barrel. The insignificant increase figures out to less than 0.1%.

To do this in the face of rising costs, the oil lines have obviously had to increase efficiency. In this respect, there has been a tremendous change.

INVESTMENT AND INCOME of gas pipelines have increased each year but investment is outstripping income so that rate of return is falling. Fig. 3.





GAS-TRANSMISSION EXPENSES are rising faster than system expands. Expenses have risen 50%; system enlarged 30% in 5-year period. Fig. 4.

One good measure of efficiency is productivity per employe. Back in 1953, these companies delivered 135,000 bbl. per year per employe. By 1959, the rate per employe was up to 210,000 bbl. That's a staggering improvement of better than 55% (Fig. 2).

Gas growth fast. Gas lines, growing at a much faster rate than oil lines, have a somewhat similar but still a different problem.

Indications are that gas-transmission costs are rising faster than gas transmission lines are growing (Fig. 4). This parallels oil's situation in that it is a trend that will eventually but inevitably end.

Another seemingly significant indication is the declining rate of return for natural-gas pipeline companies (Fig. 3). Both investment and net income have been growing rapidly but investment has been growing faster than net income. The result has been a slow but steady drop in the rate of return on investment in recent years.

Defy normal laws. Pipelines defy normal transportation laws of economics. British Petroleum's M. E. Hubbard made this clear at the World Power Conference last year. Pipelines are, Hubbard said, the "only form of long-distance continuous transport and costs fall with increasing capacity." With other forms, he continued, "the unit cost of transport remains sensibly constant regardless of the number of loads or tonnage."

Hubbard made this significant comment on the transportation of oil versus gas: "Broadly, a pipeline of given size can transport about one quarter as much calorific value of natural gas as a similar pipeline carrying oil. x x x As a general approximation, the transport of natural gas is of the order of three times the cost of transporting a thermally corresponding quantity of oil."

Differ continuously. Pipeline economics differ from those of other forms of transport and they differ between types of pipelines. And that is not the end—they also differ greatly in a specific area.

Some of these variations show up in the following pages of information on construction costs of natural-gas pipelines. It is shown, for example, that the cost per mile of laying 16-in. pipe has varied as much as 1,000%, and that the cost per horsepower of installing compressor stations can vary almost as much as 375%.

Here are other contrasts: A company crossing a state border will pay twice as much for right-of-way in one state as in the other. Another company will install three compressor stations, one at a cost of $128 per horsepower, another at $232, and the third at $478.

Thus there is a vast variety of factors that can affect pipeline-construction costs. Many of these are beyond the control of the builder. They include such factors as topography, soil conditions, weather, accessibility, availability of fuel, population density, etc. They make it a fascinating guessing game with very high stakes. The following pages give details on some guesses that have been made, some that are being made, and some of the odds the guessers face.

Interstate Petroleum and Gas-Pipeline Growth Continues

(Miles)

Year	Oil*			Gas†			Oil and Gas Lines
	Gathering	Trunk	Total	Gathering	Transmission	Total	
1954	50,689	88,273	138,962	43,790	135,370	179,160	318,122
1955	50,645	89,729	140,374	45,680	142,490	188,170	328,544
1956	51,336	91,350	142,686	47,570	151,180	198,750	341,436
1957	52,077	93,159	145,236	50,020	157,540	207,560	352,796
1958	49,787	94,567	144,354	52,010	162,990	215,000	359,354
1959	49,567	99,592	149,159	54,130	172,240	226,370	375,529

Source: *ICC, †F.P.C.

Pipeline costs don't follow a formula

WHETHER it costs more to lay a mile of line pipe this year than it did a year ago is anybody's guess. In some instances it cost a lot more, in others a lot less. The differences are so great that comparisons are invalid and averages are meaningless.

One thing is sure: It does cost more to lay pipe today than it did 7 years ago. Costs vary from project to project and from year to year. It takes several years, apparently for a trend to become recognizable.

Eight categories, from 6 to 30-in.-diameter lines, are compared in the accompanying table. Three of the eight show increases, four show decreases, and one is virtually unchanged from a year ago. Thus a good case can be made for the contention that pipe-laying costs have not changed significantly in the past year.

Up since '54. Over the years, however, there has been a marked change. Each of the eight categories shows increases from the 1954 figures. These increases vary greatly, from around 15% for 8 and 12-in. pipe to 50% for 20-in. and 75% for 16-in. These variations are so great as to be almost meaningless individually.

However, the fact that all categories are up is significant. It removes any doubt, if any existed, that laying pipe is more costly today than it was 7 years ago.

Pipeline-construction costs are generally divided into four parts: Right-of-way, material, labor, and miscellaneous. Miscellaneous includes administration, testing, etc. According to available figures, material represents something like 60% of the total, labor, 30%, right-

How pipeline costs break down—by sizes by years

6-in.	660	9,468	6,408	696	17,232	12,312	19,686	1954
	1,422	9,634	12,720	1,638	24,414	15,750	52,962	1959
	2,156	10,128	7,557	1,255	21,096	17,858	36,806	1960
	1,956	10,215	9,197	1,101	22,469	13,851	41,153	1961
8-in.	784	9,472	8,736	1,264	20,256	11,880	36,464	1954
	1,224	13,464	12,712	1,552	28,952	13,088	45,872	1959
	3,041	13,534	17,635	1,649	35,859	15,760	86,564	1960
	2,284	12,283	7,700	1,358	23,625	18,269	29,671	1961
12-in.	1,272	20,832	17,400	900	40,404	40,404	145,596	1954
	2,244	21,276	23,880	2,880	50,280	38,904	72,360	1959
	1,243	21,985	11,694	1,715	36,637	25,339	60,278	1960
	5,739	25,889	13,529	1,085	46,242	41,038	48,153	1961
16-in.	1,408	18,688	9,904	800	30,800	27,824	269,120	1954
	1,296	33,184	19,456	1,952	55,888	40,576	74,720	1959
	1,790	28,882	12,283	1,598	44,553	39,347	61,908	1960
	1,860	33,197	16,424	2,992	54,473	36,802	85,756	1961
20-in.	1,580	28,040	15,080	1,500	46,200	44,060	49,720	1954
	1,400	33,600	16,360	2,940	54,300	42,220	63,060	1959
	2,777	34,797	28,658	2,581	68,813	51,217	77,373	1960
	2,260	39,183	24,193	3,113	68,749	51,373	111,282	1961
24-in.	2,664	36,672	21,408	3,384	64,128	63,120	64,176	1954
	2,040	42,120	18,744	2,784	65,688	60,432	72,792	1959
	2,932	56,575	26,687	2,448	88,642	66,853	166,037	1960
	3,132	55,936	21,867	3,728	84,663	73,297	101,934	1961
26-in.	3,068	37,232	31,330	1,794	73,424	.....	.....	1954
	2,314	43,524	18,174	173	68,510	60,970	113,412	1959
	2,333	60,576	26,890	3,620	93,419	77,707	112,104	1960
	4,859	52,466	28,947	4,180	90,452	65,602	109,988	1961
30-in.	1,530	57,570	15,150	3,720	77,970	70,200	83,610	1954
	2,200	55,410	24,780	4,498	86,760	78,270	137,670	1959
	4,101	67,637	35,479	5,024	112,242	78,913	166,919	1960
	4,354	70,276	28,432	5,023	108,085	81,493	143,110	1961

of-way, 6%, and miscellaneous, 4%.

Material cost up. Material and right-of-way costs are two costs over which builders have no control. Both of these, particularly right-of-way costs, have gained substantially. Right-of-way costs have doubled and material, by far the biggest single element of total costs, has gone up 40%.

The increasing efficiency of pipeline construction shows up in the cost of labor. While other factors gained from 40 to 100% in 7 years, labor costs were up but 20%.

These are based on "average" figures. There is probably no business where averages are less meaningful. For example, the lowest cost per mile for 8-in. line was only a third of the highest. The lowest was 40% below "average," the highest, 90% above it. This illustrates how meaningless average figures can be.

Cost variations. Nature is an uncontrollable but important factor in pipeline construction. One company estimated ditching costs in one instance at $12,000 per mile and in another, $2,600. In the first case the soil was 55% solid rock and in the latter only 10% solid rock.

One company estimates it will cost $2,350 per mile to lay 35 miles of 30-in. line. Another figures it will cost $3,400 per mile to lay 39 miles of 30-in. line. The latter per mile rate is almost 50% higher than the former.

Still another company plans to lay 63 miles of 36-in. loop line across an interstate line. It expects

MAIN-LINE COSTS

(Reported to FPC in fiscal 1961)

Diam.		Miles	ROW	Materials	Labor	Misc.	Total
10-in.		12.6	10,838	168,072	83,522	29,459	291,891
		12.6	10,838	168,072	83,522	29,459	291,891
	$/Mile		860	13,339	6,629	2,338	23,166
16-in.		9.5	14,210	358,175	240,260	12,795	675,440
		77.513	120,715	2,629,846	1,002,311	169,780	3,922,652
		4.8	10,420	141,991	158,132	7,967	323,512
		22.7	3,421	613,189	192,992	25,814	835,416
	Total	114.513	148,766	3,743,201	1,593,695	216,358	5,702,020
	$/Mile		1,299	32,689	13,917	1,889	49,794
20-in.		56.700	151,908	1,927,142	1,525,621	141,009	3,745,680
		20.030	32,000	1,118,454	1,042,526	36,000	2,228,980
		37.340	122,700	1,578,100	785,100	51,300	2,537,200
		43.105	160,752	1,961,179	632,658	105,177	2,859,766
		68.814	158,081	3,116,029	1,114,614	114,959	4,503,683
		16.337	14,158	697,543	750,744	34,524	1,496,969
		95.300	138,202	2,997,589	2,700,085	560,706	6,396,582
		6,300	18,000	190,915	166,187	6,033	381,135
	Total	343.926	795,801	13,586,951	8,717,535	1,049,708	24,149,995
	$/Mile		2,314	39,506	25,347	3,052	70,219
24-in.		67.103	217,652	3,924,270	1,101,050	136,219	5,379,191
		71.296	208,613	4,167,147	1,313,847	138,132	5,827,739
		82.535	187,866	4,832,250	1,558,998	168,316	6,747,430
		45.655	112,995	2,605,888	1,052,446	81,751	3,853,080
		41.1	301,000	2,302,673	1,299,211	286,600	4,189,484
		71.9	171,425	3,764,873	1,900,085	562,302	6,398,685
		8.0	24,000	307,750	241,625	13,000	586,375
		45.3	132,100	2,309,340	998,690	227,589	3,667,729
	Total	432.889	1,355,651	24,214,191	9,465,952	1,613,909	36,649,713
	$/Mile		3,132	55,936	21,867	3,728	84,663
26-in.		18.73	108,280	885,047	665,534	33,749	1,692,610
		80.92	477,619	4,010,908	2,968,618	149,086	7,606,231
		13.30	3,385	572,821	759,541	26,693	1,362,440
		6.50	22,576	324,603	354,594	13,152	714,925
		21.20	69,219	846,416	386,011	89,120	1,390,766
		205.00	998,367	11,495,166	4,871,209	1,132,848	18,497,590
	Total	345.65	1,679,446	18,134,961	10,005,507	1,444,648	31,264,562
	$/Mile		4,859	52,466	28,947	4,180	90,452
30-in.		92.03	560,010	6,284,748	2,568,732	145,412	9,558,902
		164.63	963,713	10,889,157	4,532,409	327,574	16,710,853
		199.9	1,110,659	17,434,458	8,129,755	1,932,732	28,607,604
		8.4	21,956	503,434	151,283	19,521	696,204
		11.1	25,246	692,018	200,254	20,797	938,315
		9.9	4,624	615,937	174,373	11,845	806,779
		112.6	403,227	7,270,461	2,788,632	613,335	11,075,655
		117.1	335,160	7,695,000	2,833,185	421,302	11,284,647
		120.0	350,304	7,473,600	2,529,024	608,000	10,960,928
		115.7	367,660	7,999,555	3,142,234	678,454	12,187,503
	Total	951.36	4,142,559	66,858,368	27,049,881	4,778,972	102,827,390
	$/Mile		4,354	70,276	28,432	5,023	108,085

LATERAL-LINE COSTS

(Reported to FPC in fiscal 1961)

Diam.		Miles	ROW	Materials	Labor	Misc.	Total
3-in.		6.0	.....	23,040	14,468	585	38,093
	$/Mile		.....	3,840	2,411	98	6,349
4-in.		8.5	49,375	50,884	53,928	3,070	156,957
		11.67	12,419	83,738	195,141	20,007	311,305
		6.82	18,369	47,768	43,744	11,712	121,593
	Total	26.99	80,163	182,390	292,813	34,789	589,855
	$/Mile		2,970	6,758	10,849	1,289	21,856
6-in.		7.342	27,132	59,619	63,444	2,797	152,992
		7.900	20,264	70,281	227,741	6,825	325,111
		5.63	7,989	63,374	23,641	2,897	97,901
		18.5	19,356	259,307	95,535	38,998	413,259
		6.4	12,178	53,494	37,517	6,444	109,638
		6.02	5,353	40,821	42,067	4,363	92,604
		9.75	37,098	99,569	112,458	9,066	258,191
		6.2	4,268	51,608	26,167	3,834	85,877
	Total	68.342	133,638	698,073	628,570	75,224	1,535,573
	$/Mile		1,956	10,215	9,197	1,101	22,469
8-in.		8.856	39,014	122,268	97,094	4,393	262,769
		10.0	14,141	115,457	42,422	10,676	182,690
		5.0	10,978	68,169	38,693	7,865	125,705
		7.81	8,194	83,060	65,625	20,080	176,959
	Total	31.666	72,327	388,954	243,834	43,014	748,123
	$/Mile		2,284	12,283	7,700	1,358	23,625
10-in.		7.55	27,679	136,559	90,356	4,768	259,362
		17.0	152,300	379,080	318,875	25,144	875,399
	Total	24.55	179,979	515,639	409,231	29,912	1,134,761
	$/Mile		7,331	21,004	16,669	1,218	46,222
12-in.		4.72	13,435	113,597	56,317	2,406	185,755
		51.3	320,007	1,628,956	1,502,315	69,015	3,520,293
		17.0	126,378	511,800	567,295	24,107	1,229,580
		20.4	26,659	394,563	346,740	55,968	823,930
		28.46	41,573	645,430	262,961	26,787	976,751
		34.0	61,880	1,034,620	1,181,840	201,335	2,479,675
		15.9	19,354	177,561	107,052	26,970	330,937
	Total	171.78	609,286	4,506,527	4,024,520	406,588	9,546,921
	$/Mile		3,547	26,234	23,428	2,367	55,576
14-in.		22.843	55,970	559,125	305,895	16,451	937,441
		62.23	432,295	1,643,329	845,064	75,859	2,996,547
	Total	85.073	488,265	2,202,454	1,150,959	92,310	3,933,988
	$/Mile		5,739	25,889	13,529	1,085	46,242
16-in.		8.4	45,527	332,488	194,834	66,295	639,144
		5.0	18,330	140,634	100,828	5,029	264,821
		9.35	27,404	417,183	270,711	86,520	801,818
		10.8	35,348	279,609	270,717	68,624	654,298
	Total	33.55	126,609	1,169,914	837,090	226,468	2,360,081
	$/Mile		3,774	34,870	24,951	6,750	70,345
18-in.		38.9	126,006	1,425,050	621,188	78,251	2,250,495
		39.423	104,398	1,415,149	597,655	112,730	2,229,932
	Total	78.323	230,404	2,840,199	1,218,843	190,981	4,480,427
	$/Mile		2,942	36,262	15,562	2,438	57,204
20-in.		29.07	47,277	1,028,290	306,407	111,436	1,493,410
		29.07	47,277	1,028,290	306,407	111,436	1,493,410
	$/Mile		1,626	35,374	10,540	3,833	51,373

to pay twice as much for right-of-way in one state as in the other.

These are but a few of the vast variations that the accompanying data reveal. They do prove one thing: rule-of-thumb measures for comparing pipeline construction costs are highly unrealistic.

First of the accompanying tables on pipeline-construction costs shows how the various factors entering into those costs have varied by years. The tables on this and the following page show costs of completed pipeline-construction projects as reported to FPC in fiscal 1961 which ends June 30 of this year.

Sixteen Projections

Estimated costs of projected construction are shown in the final tables in this section. They cover 16 different proposals that have been submitted for commission approval. These were picked at random from the hundreds of applications on file. They vary geographically and by length and by size. River crossings are included to complete the comparison.

These projected construction costs vary in the form they are given just as the cost-accounting systems of the companies that submitted them vary. Some are quite detailed, others show little more than gross figures for broad categories.

These differences in the methods of summarizing costs add another variable to those that are inherent in pipeline construction. Cost experts in pipeline companies have repeatedly cautioned that cost figures applicable to one company are not necessarily valid for another.

Some of these projects include provision for contingencies, others do not; some include provision for engineering, others do not. Each is of interest in itself but few contribute much except another variable in the puzzle of what it costs to build a pipeline.

Station costs—$145 to $600 per horsepower

COMPRESSOR-STATION construction costs are almost as variable as pipeline-construction costs and average or mean figures are equally as unreliable as a measure of whether costs are high or low.

Completed compressor-station costs are included in the accompanying statistics. These range from a low of $145 per horsepower to a high of $600.

Compressor-station costs also vary greatly between new stations and additions to existing stations. In the latter, much of the auxiliary equipment is already in place so that those costs are not repeated.

Averages no guide. These averages are valueless as a guide. Additions ranged in cost from $145 to $419 per horsepower, almost a 1

LAND		$69,200	$69,200
STRUCTURES:			
Site improvements	$38,500	57,700	96,200
Main comp. bldg.	70,000	97,200	167,200
Other structures	17,800	27,000	44,800
Total structures			308,200
MAINS	15,100	4,800	19,900
EQUIPMENT:			
Major gas piping	272,800	130,500	403,300
Main comp. units	694,900	87,600	782,500
Cooling water system	73,600	44,800	118,400
Electrical system			
Other equipment	319,300	173,000	492,300
Total equipment			1,796,500
OFFICE:			
Furniture, fixtures	1,300		1,300
Safety equipment	3,900		3,900
Total office			5,200
TOOLS AND WORK EQUIPMENT	6,300		6,300
COMMUNICATIONS	5,600	4,100	9,700
MATERIAL AND INSTALLATION			2,215,000
CONTRACTOR'S FEE, 8%			177,000
TOTAL STATION COST			2,392,000
COST PER HP.			478

Eight equal additions—five different costs

	A (3)	B (3)	C	D	E
MATERIAL:					
Compressor building equipment	$534,000	$525,700	$529,700	$534,000	$526,700
Yard lighting and power wiring	7,130	10,000	10,000	7,130	10,000
Landscaping and improvements	3,470	3,200	3,200	3,470	3,200
Main compressor building	35,000	20,000	20,000	35,000	20,000
	$579,600	$558,900	$562,900	$579,600	$559,900
INSTALLATION:					
Compressor building equipment	$109,000	$126,900	$128,900	$130,600	$155,200
Yard lighting and power wiring	6,900	6,400	6,400	8,600	7,900
Landscaping and improvements	16,000	16,500	16,500	19,800	20,000
Main compressor building	37,000	15,000	15,000	47,000	18,500
	$168,900	$164,800	*$207,800	$206,000	$201,600
MISCELLANEOUS:					
Spare parts, temp. structures, etc.	$50,500	$48,300	$50,300	$56,000	$54,500
ADMINISTRATION:					
Including field engineering, inspection and supervision	$66,000	$64,000	$64,000	$69,400	$67,000
COST OF PROJECT	$865,000	$836,000	$885,000	$911,000	$883,000
COST PER HP.	$288	$279	$293	$304	$294

$21,700	$32,200	$53,900	$ 7,100	$17,100	$24,200
12,100	19,200	31,300	10,200	17,000	27,200
2,000	3,600	5,600	2,300	3,900	6,200
		90,800			57,600
216,500	127,800	344,300	253,300	212,000	465,300
594,900	66,800	661,700	2,400,900	259,800	2,660,700
406,100	148,100	554,200	62,800	61,000	123,800
84,800	41,700	126,500	103,700	124,900	128,600
		1,686,700			3,378,400
2,100		2,100			
2,100		2,100	2,000		2,000
		4,200			2,000
2,600		2,600			
		1,784,300			3,438,000
		142,700			275,000
		1,927,000			3,713,000
		128			232

to 3 range. New installations ranged from $178 to $600 per horsepower, far greater than a 1 to 3 range.

Still more glaring indications of cost variations are shown by individual comparisons. One company plans a number of major installations. Three different types are involved: An engine-driven reciprocating unit, an electric-motor-driven centrifugal unit and a gas-turbine unit.

Station costs. Two 2,500-hp. engine-driven reciprocating units will be installed in Louisiana at an estimated cost of $478 per horsepower. The 15,000-hp. electric-driven centrifugal unit will go in in Tennessee at an estimated cost of only $128 per horsepower. The two 8,000-hp. gas-turbine units are to be installed in Kentucky at an estimated cost of $232 per horsepower.

Still another interesting comparison is that of a company which plans to make additions of 8,000 hp. in each of eight different locations. Despite the fact that these installations have the same horsepower, costs of construction will vary as much as 10%.

State	Hp.					
Alabama*	8,000	$ 1,867,600	$ 717,000	$ 462,400	$ 3,047,000	$381
Arkansas†	3,000	562,900	207,800	114,300	885,000	295
Arkansas†	3,000	579,600	167,900	116,500	864,000	288
Illinois†	3,000	579,600	206,000	125,400	911,000	304
Illinois†	3,000	559,900	201,600	121,500	883,000	294
Indiana*	6,000	1,547,600	532,400	180,000	2,260,000	377
Kentucky*	5,000	1,070,600	435,000	281,400	1,784,000	357
Kentucky†	2,000	468,530	176,130	28,550	673,210	337
Kentucky†	4,000	943,035	502,715	83,800	1,529,550	382
Kentucky†	16,000	2,842,300	595,700	461,000	3,899,000	244
Louisiana*	8,000	1,899,600	735,000	514,400	3,149,000	308
Louisiana†	2,000	417,850	176,850	29,500	624,200	312
Louisiana†	3,000	558,900	164,800	112,300	836,000	279
Louisiana†	3,000	579,600	167,900	116,500	864,000	288
Louisiana*	5,000	1,519,000	696,000	297,000	2,512,000	502
Mississippi*	8,000	1,867,600	717,000	454,400	3,039,000	380
Mississippi*	8,000	1,867,600	717,000	453,400	3,038,000	380
Mississippi†	2,000	353,000	167,000	82,000	602,000	301
New York*	6,800	1,334,000	480,000	208,000	2,094,000	308
Ohio*	15,000	1,245,200	467,800	230,000	1,943,000	130
Tennessee†	2,500	424,300	180,000	95,700	700,000	280
Tennessee†	3,000	558,900	164,800	114,300	838,000	279
Tennessee†	15,000	1,344,900	439,400	238,700	2,023,000	135
Texas*	7,000	2,090,000	423,000		2,513,000	359
Texas†	3,000	579,600	168,900	116,500	865,000	288
*New stations	76,800	$16,308,800	$5,920,200	$3,153,000	$25,382,000	$330
†Additions	67,500	11,352,915	3,687,495	1,954,550	16,994,960	252
Total	144,300	27,661,715	$9,607,695	$5,107,550	$42,376,960	$294

What compressor stations cost in 15 states

	Cap. (Hp.)	Land and Improve.	Structure and Equip.	Misc. and Const.	Total	Per Hp.	Year Built	New or Addition
Alabama	1,750	....	$241,782	$12,091	$253,873	$145	1959-60	Addition
	1,350	....	299,395	12,644	312,039	231	1959-60	Addition
Indiana	1,320	....	399,244	33,220	432,464	328	1959	Addition
	440	....	130,407	15,504	145,911	332	1959	Addition
Illinois	1,320	....	336,600	40,100	376,700	285	1960	Addition
Kansas	2,000	....	364,878	19,870	384,748	192	1960	Addition
	2,500	....	433,678	14,593	448,271	179	1960	Addition
	2,000	$2,036	432,650	29,759	464,445	232	1959-60	Addition
	1,000	....	167,393	10,313	177,706	178	1960	New
Kentucky	1,800	11,573	781,529	92,580	885,682	492	1959	New
	2,000	....	770,331	64,860	835,191	419	1959	Addition
	2,000	....	709,625	21,409	731,034	366	1959	Addition
	2,000	....	539,105	48,464	587,569	294	1959-60	Addition
	4,000	....	1,010,290	59,881	1,070,171	268	1959-60	Addition
	1,500	....	458,237	32,436	490,673	327	1959-60	Addition
Louisiana	550	....	201,603	13,178	214,781	391	1959-60	Addition
	2,700	....	756,133	55,419	811,552	301	1959-60	Addition
	2,000	....	451,237	32,744	483,981	242	1959	Addition
	2,000	....	516,088	37,910	553,998	277	1959-60	Addition
	3,000	25,668	877,266	73,226	976,160	325	1960	Addition
	550	....	221,127	2,234	223,361	263	1960	Addition
	1,760	....	969,091	87,444	1,056,535	600	1959-60	New
Montana	880	....	223,522	7,701	231,223	263	1960	Addition
Nebraska	2,000	1,259	443,726	8,394	453,379	227	1959-60	Addition
New York	1,320	....	266,100	7,200	273,300	207	1960	Addition
	1,000	1,700	220,600	12,000	234,300	234	1960	Addition
Ohio	2,000	....	564,842	73,429	638,271	319	1959-60	Addition
Oklahoma	9,000	....	2,241,481	118,658	2,360,139	262	1959-60	New
Pennsylvania	125	....	37,730	5,520	43,250	346	1960	New
	125	....	55,130	5,860	60,990	488	1960	New
	700	....	255,800	9,900	265,700	379	1960	New
	125	....	43,700	6,370	50,070	401	1960	New
	225	....	40,760	8,580	49,340	219	1960	New
	490	....	95,410	11,990	107,400	219	1960	Addition
	6,000	....	3,286,940	466,869	3,753,809	235	1959-60	Addition
Tennessee	2,000	....	681,894	20,586	702,480	351	1959	Addition
	2,500	....	901,588	79,200	980,788	392	1959-60	Addition
	2,000	....	495,517	42,598	538,115	269	1959-60	Addition
Texas	1,920	....	791,650	59,920	851,570	444	1959-60	New
	2,500	3,097	534,515	46,435	584,047	234	1960	Addition
	850	....	221,127	2,234	223,361	263	1960	Addition
West Virginia	1,100	....	291,820	29,542	321,362	292	1960	Addition
	6,400	....	1,955,700	181,300	2,137,000	334	1959-60	Addition
	2,000	....	537,000	63,000	600,000	300	1959-60	Addition
	8,000	29,870	2,552,528	234,926	2,817,324	352	1959-60	New
New	24,780	41,623	7,936,792	640,071	8,618,486	348	....	....
Additions	68,020	33,580	19,869,977	1,672,020	21,575,577	317	....	.....
Total	92,800	75,203	27,806,769	2,312,091	30,194,063	325	....	.....

165 Miles, 20-in. line, Louisiana to Mississippi

Item	Quantity	Unit Cost	Totals
Survey, miles	163	$ 500	$ 81,500
ROW, damages, miles	163	3,840	625,920
Subtotal			$ 707,420
Materials			
Pipe (0.312-in. 65.71 lb./ft.), miles	155	39,031	6,049,805
Pipe (0.375-in., 78.60 lb./ft.), miles	8	44,613	356,904
Pipe (0.531-in., 110.46-lb./ft.), ft.	2,600	14.25	37,050
Valves (20-in. ASA 600, gate)	12	7,035	84,420
Valves (20-in. ASA 600, plug)	10	5,246	52,460
Valves (8-in. x 6-in. ASA 600, gate)	19	945	17,955
Coating, miles	158	2,275	359,450
Concrete coating, miles	5	29,040	145,200
Casing (26-in., 0.375-in. 102.63 lb./ft.), ft.	10,600	10.31	109,286
Other material			493,000
Subtotal, material			$ 7,705,530
Installation cost			
Company portion, miles	163	4,400	717,200
Contract portion, miles	163	27,192	4,432,296
Sub-total, installation			$ 5,149,496
Total pipeline cost			13,562,000
River crossings (6, 16,500 ft.)			4,082,000
Total cost inc. crossings			17,644,000

16.41 Miles, 36-in. main line, Virginia

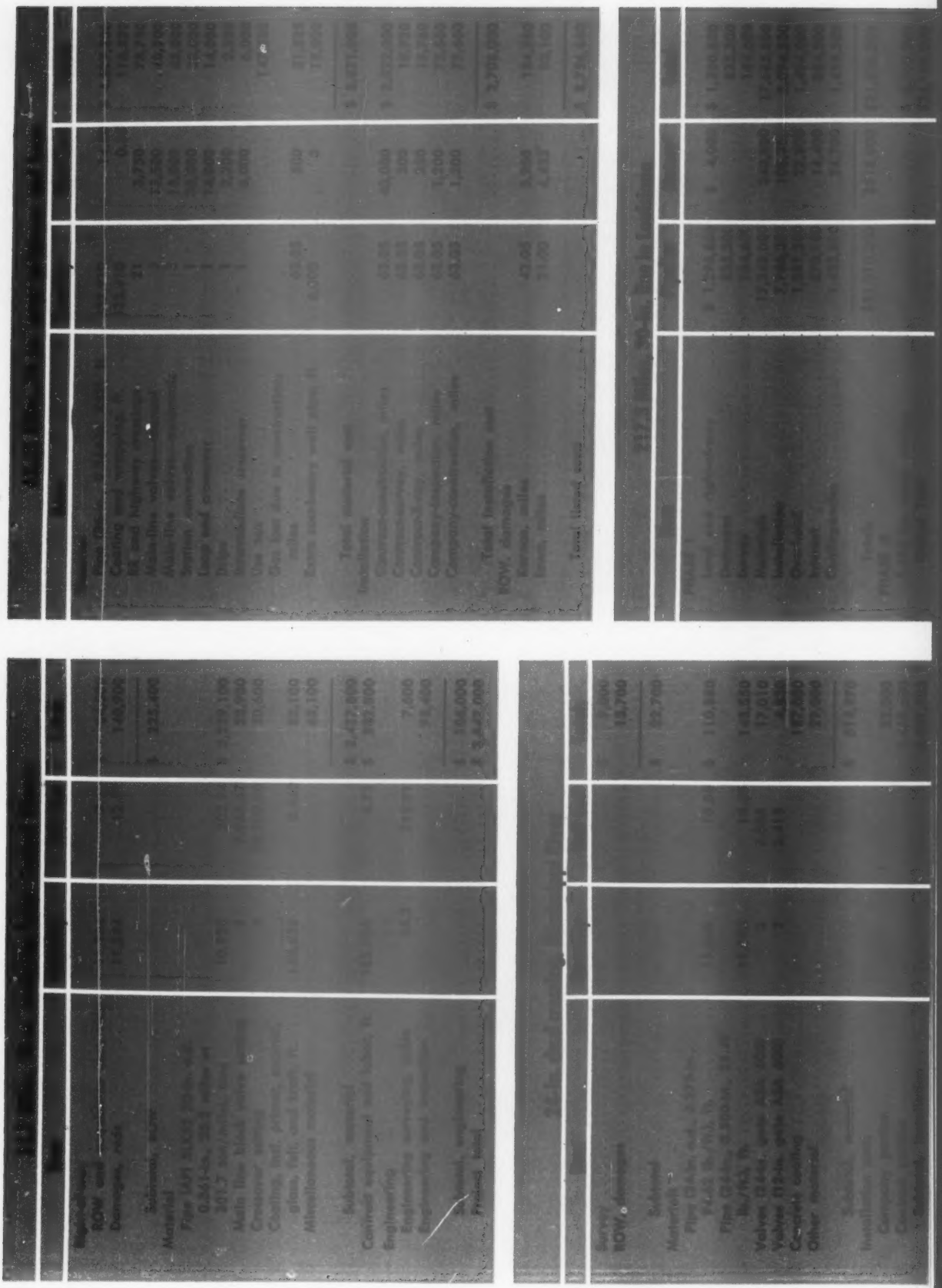
Item	Quantity	Unit Cost	Totals
ROW, damages, rods	5,251	$ 12.00	$ 63,012
Material			
Pipe (36-in., 0.406-in. X52), ft.	86,378	15.33	1,323,211
Pipe (36-in., 0.469-in. X56), ft.	700	17.64	12,348
Other			
Coating, valves, etc.	1 lot		179,495
Installation			
Prime contractor:			
Install 36-in. line, ft.	86,645	574	497,342
Other installation	1 lot		94,713
Surveys, field engineering,			
Supervision, miles	16.41	2,500	41,025
Total est. direct cost			$ 2,211,246

22.34 Miles, 36-in. loop with Ohio River crossing

Item	Quantity	Unit Cost	Totals
ROW, damages, rods	7,146	$ 18	$ 128,628
Preliminary survey, miles	22.34	800	17,872
Material and installation			
Pipe (36-in. o.d., 0.375 in.), tons	7,384	196	1,447,264
Pipe (36-in. o.d., 0.500 in.), tons	970	195	189,150
Installation, ft.	113,365	7.60	861,574
Coating material, ft.	113,365	1.00	113,365
Valves, drips, etc.			
Main line valve assemblies	4	22,500	90,000
Suction and discharge valves	2	21,500	43,000
Crossover assemblies	3	15,500	46,500
Drips	2	3,700	7,400
Highway and RR crossings			
42-in. o.d. casing pipe, ft.	700	65	45,500
Weights, anchors, sleeves			
Weights, tons	30	35	1,050
River crossings, Ohio River, ft.	4,590	28	428,520
Miscellaneous material—2%			41,175
Total			$ 3,460,998
Field engineering and inspection, miles	22.34	2,500	55,850
General overhead			270,797
Contingencies			284,355
Total cost of project (22.34 miles at $182,274/mile)			$ 4,072,000

14.97 Miles, 36-in. in South Carolina

Item	Quantity	Unit Cost	Totals
ROW, damages (rods)	4,790	$ 12.00	$ 57,480
Material			
Pipe (36-in. 0.406-in. X52), ft.	69,117	15.33	1,058,872
Pipe (36-in. 0.469-in. X52), ft.	9,000	17.64	158,760
Pipe (36-in. 0.500-in. X56), ft.	1,320	19.44	25,661
Other:			
Coating, valves, etc.	1 lot		242,217
Installation			
Prime contractor:			
Install 36-in. line, ft.	79,042	5.74	453,701
Other installation	1 lot		89,959
Surveys, field engineering and super, miles	14.97	2,500	37,425
Total estimated direct cost			$ 2,124,075



Item	Quantity	Unit Cost	Total
Survey, miles	39.5	$ 600	$ 23,700
ROW, damages, miles	39.5	5,760	227,520
Subtotal			$ 251,220
Material			
Pipe (30-in., 0.375-in., 118.65 lb./ft.), miles	38.0	63,589	$ 2,416,382
Pipe (30-in., 0.469-in., 147.84 lb./ft.), miles	2.0	79,231	158,462
Pipe (30-in., 0.656-in., 205.66 lb./ft.), ft.	1,700	25.60	43,520
Valves (30-in. ASA 600 gate)	10	13,600	136,000
Valves (30-in. x 24-in. ASA 600 plug)	2	11,865	23,730
Valves (24-in. ASA 600 gate)	6	8,500	51,000
Valves (16-in. ASA 600 gate)	4	4,515	18,060
Valves (10-in. x 8-in. ASA 600 gate)	16	1,260	20,160
Coating, miles	39.5	3,400	134,300
Casing (36-in., 0.375-in., 142.65 lb./ft.), ft.	3,500	14.34	50,190
Other material			387,000
Subtotal, material			$ 3,352,990
Installation cost			
Company portion, miles	39.5	4,400	173,800
Contract portion, miles	39.5	55,176	2,179,452
Subtotal, installation			2,331,252
Total pipeline cost			

Item	Quantity	Unit Cost	Total
Survey, miles	88.83	$ 600	$ 53,298
ROW, damages, miles	88.83	5,760	511,637
Subtotal			$ 564,935
Material			
Pipe (30-in., 0.375-in., 118.65 lb./ft.), miles	88.7	63,274	5,612,164
Pipe (30-in., 0.469-in., 147.84 lb./ft.), miles	1.0	78,841	78,841
Pipe (30-in., 0.656-in., 205.66 lb./ft.), ft.	1,500	25.60	38,370
Valves (30-in. ASA 600 gate)	13	13,600	176,800
Valves (30 x 24-in. ASA 600 plug)	4	11,865	47,460
Valves (10 x 8-in. ASA 600 gate)	17	1,260	21,420
Coating, miles	88.83	3,400	302,022
Casing (36-in., 0.375-in., 142.65 lb./ft.), ft.	6,500	14.34	93,210
Other material			500,000
Subtotal, material			$ 6,872,412
Installation cost			
Company portion, miles	88.83	4,400	390,852
Contract portion, miles	88.83	49,104	4,361,908
Subtotal installation			4,752,760
Total pipeline cost			

Item	Quantity	Unit Cost	Total
Survey, miles	24.67e	$ 600	$ 14,802
ROW, damages, miles	24.67e	15.91	374,000
Subtotal, ROW			388,802
Materials			
Pipe (76.8 miles API 5LX52, 24-in., 0.375-in., 270.94 ton/mile), tons	21,26-	201.3	4,284,000
Block-valve settings	7	15,841.2	89,300
Coating material complete, ft.	405,504	0.43	174,000
Miscellaneous material			127,200
Subtotal materials			$ 4,729,400
Contract equipment and labor, ft.	405,504	4.90	$ 1,985,700
Engineering			
Surveying, miles	76.8	220.0	16,900
Engineering, inspection			
Subtotal, engineering			268,500
Project total			$ 7,372,000

Item	Quantity	Unit Cost	Total
ROW, acquisition, rod	7,744	$ 4.00	$ 31,000
Damages, rods	7,744	5.80	44,800
Subtotal, ROW			$ 77,800
Material			
Pipe (API 5LX52, 18-in., 0.344-in., 171.12 ton/mile), tons	4,221	202.5	850,200
Block valve settings	3	6,733.3	20,200
Crossover settings	3	13,666.6	41,000
Coating material complete, ft.	127,776	0.43	55,000
Miscellaneous material			28,200
Subtotal, materials			$ 1,032,800
Contract equipment and labor, ft.	127,776	4.90	$ 626,000
Engineering			
Surveying, miles	24.2	548.35	13,300
Engineering, inspection			99,000
Subtotal, engineering			112,300
Project total			$ 1,771,900

227.6 Miles, 30-in. transmission line, Texas

Item	Materials	Labor	Total
Pipe	$13,879,500		$13,879,500
Pipe freight	1,079,100		1,079,100
Right-of-way	429,700	$107,400	537,100
Survey	31,300	25,600	56,900
Damages	456,500	80,600	537,100
Clearing, ROW	118,900	86,100	205,000
Unload, haul, string	365,600	103,009	468,600
Ditching (55% solid rock)	1,517,500	1,192,400	2,709,900
Bending	64,300	96,400	160,700
Line up and weld	197,000	624,000	821,000
Clean, prime, paint and wrap	673,500	362,600	1,036,100
Lower in	43,400	48,900	92,300
Backfill and cleanup	109,400	145,000	254,400
Highway and RR crossings	50,500	33,700	84,200
Valve assemblies	478,200	84,400	562,600
Test, purge and pack	56,300	27,900	84,200
Moving men and equipment in and out	177,200	95,500	272,700
Accessory equipment	46,300	37,900	84,200
Other field costs	524,480	174,800	699,280
Total Direct Cost	$20,298,780	$3,326,100	$23,624,880
Unit cost—$103,800 per mile			

61.3 Miles, 10¾ in. pipeline, Washington

Item	Materials	Labor	Total
Pipe (0.188 in.)	$700,900		$700,900
Pipe freight	155,300		155,300
Right-of-way	19,600	4,900	24,500
Survey	16,850	13,800	30,650
Damages	26,050	4,600	30,650
Clearing ROW	140,650	101,800	242,450
Unload, haul, string	25,100	7,100	32,200
Ditching (10% rock)	90,500	71,000	161,500
Bending	6,500	9,700	16,200
Lineup and weld	34,900	110,400	145,300
Clean, prime, coat, wrap	105,000	56,500	161,500
Lower in	15,200	17,150	32,350
Backfill and clean up	34,800	46,100	80,900
Highway and RR crossings	58,500	39,000	97,500
Valve assemblies	13,300	2,200	16,500
Test, purge, and pack	6,200	3,000	9,200
Moving men and equipment	21,000	11,200	32,200
Accessory equipment	10,100	8,300	18,400
Other field costs	41,420	13,800	55,220
Total Direct Cost	$1,526,870	$520,550	$2,047,420
Unit cost—$33,400 per mile			

37.4 Miles, 8⅝-in. line in Arizona

Item	Materials	Labor	Total
Pipe	$331,700		$331,700
Pipe freight	67,100		67,100
Right-of-way	15,000	3,700	18,700
Survey	1,500	1,300	2,800
Damages	15,900	2,800	18,700
Clearing ROW	8,800	6,300	15,100
Unload, haul, string	9,300	2,600	11,900
Ditching (30% solid rock)	71,500	56,200	127,700
Bending	3,800	5,800	9,600
Line up and weld	14,800	46,700	61,500
Clean, prime, paint, and wrap	50,800	27,400	78,200
Lower in	3,200	3,700	6,900
Backfill and cleanup	8,300	11,000	19,300
Highway and RR crossing	1,900	1,300	3,200
Valve assemblies	7,500	1,300	8,800
Test, purge, and pack	2,800	1,400	4,200
Moving men, equipment in, out	13,500	7,200	20,700
Accessory equipment	2,000	1,700	3,700
Other field costs	18,100	6,120	24,200
Total Direct Cost	$647,500	$186,520	$834,020
Unit cost—$22,300 per mile			

22.1 Miles, 30-in. main line loops, Kentucky, Illinois

Item	Quantity	Unit Cost	Total
Right-of-way			
ROW, cost of acquisition, rods	7,072	$2.50	$ 17,700
Damages, rods	7,072	7.48	52,900
Subtotal, ROW			70,600
Material			
Pipe (API 5LX52, 30-in. o.d. 22.1 miles at 301.5 ton/mile), tons	6,776	204.69	1,386,300
Coating material, ft.	116,688	0.586	68,400
Miscellaneous material			55,400
Subtotal, material			$ 1,510,100
Contract equipment and labor, ft.	116,688	5.082	586,000
Engineering			
Surveying, miles	22.1	221.72	4,900
Engineering and Inspection			66,400
Subtotal, engineering			$ 71,300
Project total			$ 2,238,000

Capital expenditures in the refining industry

BY W. L. NELSON

CAPITAL EXPENDITURES are primarily the sum of the costs of improvements (or new processes) and enlargements of capacity. Such expenditures are investments which should produce additional profit or which will strengthen the competitive position of the refiner, whereas obsolescence costs constitute a direct loss. The costs of improvements and obso-

TABLE 1—OBSOLESCENCE, IMPROVEMENT, AND ENLARGEMENT COSTS AS PERCENTAGE PER YEAR* OF THE REPLACEMENT COST OF REFINERIES

Year—	Refinery cost, $/bbl.† Lt. oil	Lube	Avg.	Enlargement costs‡ (yearly)	At date of changes: Improvements Lt. oil	Lube	Obsolescence Lt. oil	Lube	Running average (20 years): Improvements Lt. oil	Lube	Avg.	Obsolescence Lt. oil	Lube	Avg.
1890-1899	100	370	289	....	3.06	0.88	....	....	1.45	0.41	1.09	....	....	....
1900-1909	128	450	289	....	0.29	0.59	....	....	1.60	0.70	1.20	....	....	....
1909	145	480	284	1.53	....	....	....	....	1.60	0.74	1.22	....	....	....
1910	150	495	288	9.10	1.40	0.18	....	....	0.35	0.51	0.40	....	....	....
1911	155	502	292	5.35	....	....	....	....	0.35	0.34	0.35	....	....	....
1912	160	510	296	1.71	....	0.15	....	....	0.35	0.34	0.35	....	....	....
1913	165	517	301	7.30	....	....	....	....	0.35	0.34	0.35	....	....	....
1914	170	526	306	4.45	....	....	....	....	0.35	0.34	0.35	....	....	....
1915	175	535	311	3.43	22.43	11.30	....	0.08	1.48	0.91	1.31	1.52	0.004	1.12
1916	185	555	299	4.65	0.38	....	....	....	1.35	0.88	1.22	1.52	0.004	1.13
1917	195	575	287	8.65	....	....	....	....	1.35	0.88	1.22	1.52	0.004	1.13
1918	206	595	275	12.57	....	....	....	....	1.35	0.88	1.23	1.52	0.004	1.13
1919	218	615	263	5.75	....	....	....	....	1.35	0.88	1.23	1.52	0.004	1.13
1920	230	635	251	11.40	....	....	....	....	1.35	0.65	1.18	1.52	0.004	1.13
1921	245	680	283	10.75	....	....	....	....	1.35	0.65	1.19	1.52	0.004	1.13
1922	260	720	315	2.12	2.40	14.94	....	0.83	1.47	1.40	1.45	1.52	0.045	1.19
1923	275	735	350	7.40	1.99	0.37	....	....	1.52	1.41	1.49	1.52	0.045	1.20
1924	285	725	383	12.25	....	....	....	....	1.53	1.41	1.50	1.52	0.045	1.29
1925	295	700	416	0.22	37.50	39.67	32.30	17.88	3.30	3.53	3.35	1.52	0.935	1.40
1926	300	660	405	1.81	....	....	....	....	3.30	3.53	3.35	1.52	0.935	1.40
1927	295	635	395	6.62	....	....	....	....	3.30	3.53	3.34	1.52	0.935	1.40
1928	290	610	385	4.46	5.80	0.06	....	....	3.59	3.59	3.59	1.52	0.935	1.40
1929	285	585	375	5.98	1.25	....	....	....	3.66	3.59	3.64	1.52	0.935	1.40
1930	280	570	367	5.80	19.48	14.24	11.75	8.70	5.07	4.30	4.92	2.15	1.37	2.00
1931	270	555	362	1.24	0.76	1.09	....	....	5.04	4.35	4.92	2.15	1.37	2.00
1932	260	540	357	0	6.35	0.33	2.34	0.69	5.42	4.36	5.22	2.26	1.40	2.10
1933	265	530	352	0	1.48	12.17	....	0.36	5.48	4.97	5.38	2.26	1.42	2.12
1934	255	530	347	1.91	....	....	....	....	5.48	4.97	5.37	2.26	1.42	2.12
1935	260	535	342	1.07	45.06	55.93	22.83	14.93	6.62	7.21	6.71	3.40	2.27	3.14
1936	270	555	349	1.68	0.17	....	....	....	6.61	7.21	6.72	3.40	2.26	3.17
1937	280	575	356	3.97	1.06	0.52	....	....	6.67	7.23	6.74	3.40	2.26	3.17
1938	290	595	363	0	....	....	....	....	7.18	7.23	7.19	3.40	2.26	3.17
1939	300	620	370	0	10.50	3.09	....	....	7.18	7.41	7.22	3.40	2.26	3.17
1940	310	*650	378	4.19	1.16	0.39	....	....	7.24	7.41	7.27	3.40	2.26	3.17
1941	325	675	387	0	9.66	3.57	....	....	7.72	7.59	7.88	3.40	2.26	3.17
1942	340	700	403	4.75	....	....	....	....	7.60	6.84	7.42	3.40	2.12	3.13
1943	355	725	420	0	6.02	0.62	....	....	7.90	6.84	7.68	3.40	2.12	3.13
1944	375	755	436	4.25	2.80	....	....	....	7.94	6.84	7.72	3.40	2.12	3.13
1945	395	785	454	4.89	10.00	5.28	3.12	1.16	6.07	5.12	5.87	2.00	1.29	1.85
1946	415	825	485	0.10	....	....	....	....	6.07	5.12	5.87	2.00	1.29	1.85
1947	435	885	515	3.07	....	....	....	....	6.07	5.12	5.87	2.00	1.29	1.85
1948	460	945	545	5.74	....	....	....	....	6.29	4.86	5.98	2.00	1.29	1.85
1949	490	1,015	580	4.35	30.00	26.10	....	....	7.71	6.17	7.40	2.00	1.29	1.85
1950	530	1,100	615	0	8.10	1.02	....	....	6.64	5.51	6.40	1.41	0.86	1.29
1951	580	1,200	640	4.80	7.70	....	....	....	6.98	5.46	6.66	1.41	0.86	1.29
1952	630	1,300	696	4.28	16.16	5.55	1.33	0.44	7.50	5.72	7.16	1.36	0.84	1.26
1953	680	1,400	751	2.80	18.70	5.24	....	....	8.39	5.36	7.84	1.36	0.83	1.26
1954	730	1,500	806	2.51	2.00	0.94	....	....	8.42	5.41	7.92	1.36	0.83	1.26
1955	790	1,610	871	2.32	11.83	5.23	1.13	0.41	6.76	2.88	6.10	0.27	0.10	0.24
1956	850	1,720	937	2.42	0.46	0.22	0.46	0.12	6.74	2.89	6.06	0.30	0.11	0.27
1957	895	1,810	987	2.24	....	....	....	....	6.69	2.88	6.06	0.30	0.11	0.27
1958	930	1,880	1,025	1.40	....	....	....	....	6.69	2.88	6.10	0.30	0.11	0.27
1959	967	1,955	1,065	2.15	....	....	....	....	6.19	2.71	5.68	0.30	0.11	0.27
1960	996	2,020	1,098	0.98	....	....	....	....	6.15	2.69	5.65	0.30	0.11	0.27

*On replacement, not book, value. †Based on "How Complexity Boosts Refinery Costs," The Oil and Gas Journal, Dec. 9, 1957, p. 137, and on Nelson Construction Index after 1956. ‡Based on half of the cost of new refineries complete with all auxiliary services.

lescence has been estimated in Process Costimating Numbers 90 and 92 (The Oil and Gas Journal, March 6, 1961, p. 143, and April 17, 1961, p. 113). They are summarized here as percentages of refinery replacement cost (see Table 1 and Fig. 1). Enlargement costs are also introduced and these along with the cost of improvements constitute the capital expenditures required to keep the refiner in business.

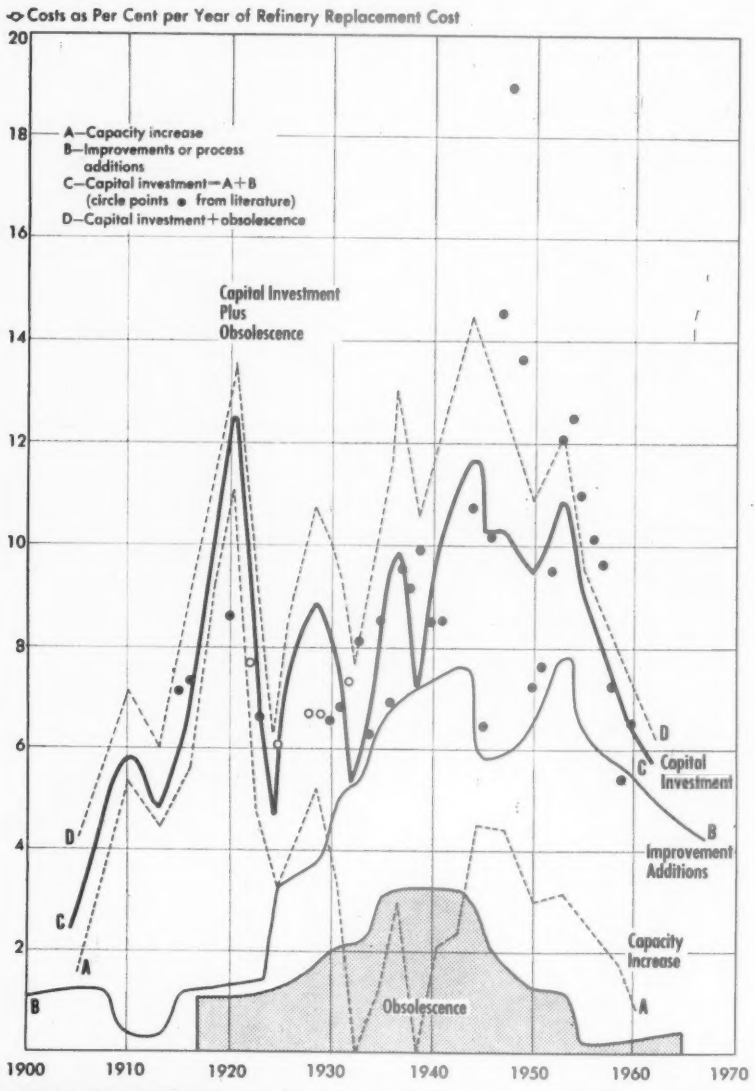
Fig. 1 reveals that capital expenditures since 1915 have ranged from 5 to 12.5% per year of the refinery replacement cost. To this should be added the losses by obsolescence and the cost of dividends or bond interest (3-4%) making an average over the years which exceeds 13.5%.

The obsolescence costs (Process Costimating No. 92) are a 20-year running average of such costs since 1910. The capacity enlargement costs are the yearly increases in crude-oil capacity charged at half the cost of new refineries (with all auxiliary equipment). Capital expenditures from the literature (Chase National Bank, U. S. Department of Commerce, etc.) shown as circle points on Fig. 1 are not very satisfactory because they fluctuate so widely and because they probably do not take properly into account those constructions or changes which are not handled by outside contractors. Table 2 indicates, however, that the total expenditures of the literature check reasonably well with the costs found here.

Readers have been concerned about the dates assigned to the process changes. These are not the dates of invention (or patents) nor the date of first application. They are simply representative of the general period during which widespread application occurred.

However, note that the selection of a date that is not fully representative means only that the basic refinery cost is changed slightly. Thus, scarcely any change in the cost of the process innovation occurs because the capital expenditures are stated as percentages of the refinery replacement cost of that same date. The use of a 20-year running average even further decreases the effect of the date used to represent the innovation.

The averaging or smoothing of discontinuous data is always difficult. Accordingly, the basic data from Process Costimating articles are presented in Table 1 so that they can be assembled in any way that is useful to the reader. No great increase in expenditures seems probable through 1965. Improvement and enlargement expenditures may increase slightly but obsolescence costs will probably remain low.



CAPITAL EXPENDITURES since 1915 have ranged from 5 to 12.5% per year of the refinery replacement cost. Fig. 1.

TABLE 2

Comparison of Capital Expenditures for Petroleum Refineries from the Literature with Those Found Here
(Millions of dollars)

Year	Computed herein: Enlargement	Computed herein: Improvements	Computed herein: Total	Average from lit.
1934	23.5	66.0	89.5	77
1935	13	83	96	105
1936	22	87	109	89
1937	56	95	151	135
1938	0	103.5	103.5	132
1939	0	105	105	144
1940	62	108	170	125
1941	0	127.5	127.5	137
1942	86	134.5	220.5	...
1943	0	142	142	...
1944	87	159	246	220
1945	112	135	247	147
1946	2.5	144.5	147	250
1947	84.5	161	245.5	400
1948	182	190	372	600
1949	157.5	268	425.5	420
1950	0	244.5	244.5	275
1951	206	285	491	325
1952	213	357	570	470
1953	157	440	597	675
1954	157	496	653	780
1955	163	429	592	770
1956	189	475	664	790
1957	210	332	542	900
1958	140	610	750	720
1959	232	613	845	580
1960 est.	111	640	751	730
Total	*2,580	*6,754	*9,334	†9,996

*1942 and 1943 not included. †During the latest years, this included some petrochemical-plant construction.

CONTROL . . . essential element in efficiency!

"Efficiency is the capacity to produce desired results." On this thesis lies Brown & Root's ability to satisfy clients. ▲ Under its own roof . . . with its own personnel and equipment Brown & Root has the capability of a "turnkey" job. From preliminary engineering through final design . . . through purchasing, expediting, logistic support and the manifold phases of construction, every step of the way is carefully controlled. This control can be interpreted in fast economical completion for you. ▲ If your organization is planning new construction or plant expansion, you will profit by talking to the man from Brown & Root.

BROWN & ROOT INC.

ENGINEERS • CONSTRUCTORS

NEW YORK • TORONTO

LONDON • EDMONTON

MONTREAL • SAO PAULO

WASHINGTON

POST OFFICE BOX 3, HOUSTON 1, TEXAS • CABLE ADDRESS: BROWNBILT

Petrofos®

(fast-dissolving sodium tripolyphosphate)

New low-cost accelerator for secondary oil recovery!

Extensive laboratory tests and successful field applications have proved that PETROFOS greatly improves injection rate of waterfloods—*at low cost.*

At the water plant, a PETROFOS fresh-water solution is prepared—and then simply metered into the injection stream.

RESULTS? PETROFOS promotes wetting of reservoir surfaces by the treated floodwater—speeding up displacement of oil. With the same (*or even reduced!*) wellhead pressure, use of PETROFOS sharply increases both your water injectivity and oil-recovery rates. Flooding time shortens—assuring big operational savings.

PETROFOS field applications with a variety of well formations and injection waters have produced substantial injectivity rate increases.

TYPICAL APPLICATION (Bartlesville sand formation)		Average Water Injectivity (barrels per day/psi)
Before Treatment	August 1959	0.50
After Adding PETROFOS	December 1959	0.78
	May 1960	0.82
	September 1960	0.91

COST? Negligible—compared to savings that result. PETROFOS treatment in applications to date ranges from *only 5¢ to 20¢ per 100 barrels of water!*

WANT MORE FACTS? We'll be pleased to send you application and cost details outlined in our *Technical Bulletin 219.*

PETROFOS: Reg. TM of Monsanto Chemical Company

MONSANTO CHEMICAL COMPANY
Inorganic Chemicals Division
Department 4219
St. Louis 66, Missouri

Monsanto®

Laboratory and field tests show how to get

Low-cost water-flood treatment with sodium tripolyphosphate

BY ROBERT T. JOHANSEN, RAYMOND J. HEEMSTRA, AND LOY HEMBREE

INJECTION-WELL PLUGGING and corrosion add up to make troublesome water floods.

Common well-cleaning techniques—backflowing, jet washing, acidizing, hydraulic fracturing, or combinations of these are expensive, and there is no assurance that the condition will not turn up again in a few months. Bailing and swabbing are effective, but are time consuming, and the cure they provide is temporary.

Laboratory studies and field tests have shown that the use of sodium tripolyphosphate (STP) may be the answer to the problem of improving injection rates in these troublesome water floods.

Chemical properties. Polyphosphates have the ability to promote wetting. At the same time they act as complexing agents for heavy metal ions that may form plugging precipitates. The net results from using STP in treating flood water are increased injection rates with decreased injection pressures. In addition, STP has the added advantage of keeping pipelines and meters free from iron oxide or hard-water deposits.

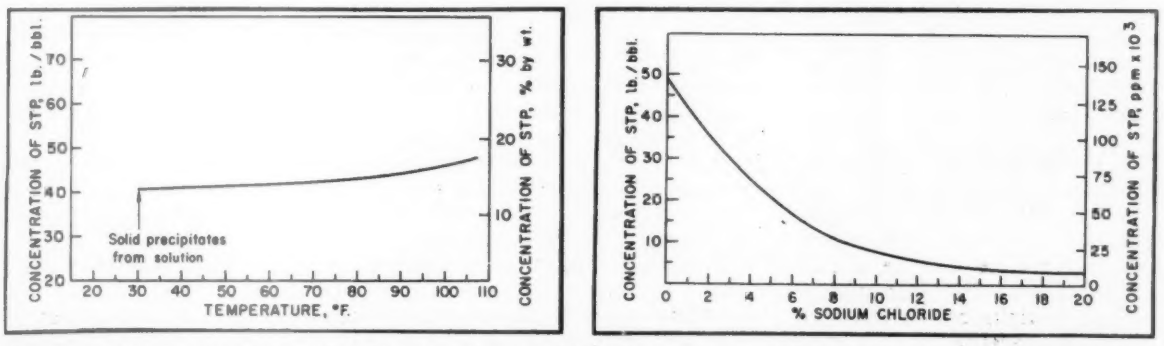
Sodium tripolyphosphate is one of the few materials that possess the qualities desired for treating injection waters. STP is effective at concentrations low enough to be economical. It is compatible with many kinds of reservoir brines and injection waters, easily and safely handled, free from undesirable side effects, and readily available.

Several chemicals were studied in the laboratory by using the interfacial-tension capillarimeter developed by Bureau of Mines chemists.[1 2] To be effective a chemical must promote wetting without lowering the interfacial tension between the water and oil. Reversing the wettability of an oil-wet system permits more efficient displacement of the oil at lower pressures. STP enhances the displacement of a water-wet system and reverses the wettability of an oil-wet system, thereby reducing injection pressures and increasing displacement efficiencies.

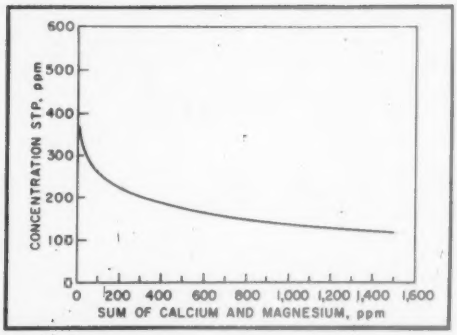
Sodium tripolyphosphate was selected for field testing because of its reliable performance in the laboratory. STP was chosen rather than one of the other polyphosphates because of its availability in quantity, better solubility characteristics, stability in solution, and greater effectiveness. It also is compatible with most chemical additives used in water systems—bactericides, corrosion-inhibitors, or solid flocculating materials. It has been demonstrated that STP does not deflocculate clays.

Fig. 1 shows the approximate solubility of STP in fresh water and shows only a slight change in solubility with variations of temperature. However, its solubility is affected by the salts contained in brines, making it necessary to take some precautions when starting STP flood treatments. For comparitive purposes, Fig. 2 shows the decrease in solubility of STP as the concentration of sodium chloride increases, and Fig. 3 shows the approximate decrease in solubility of STP as the calcium and magnesium contents of

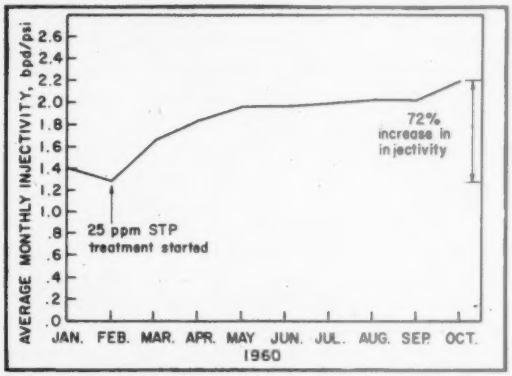
Johansen and Heemstra are physical chemists, Bartlesville Petroleum Research Center, Bureau of Mines, U. S. Department of the Interior, Bartlesville, Okla. Hembree is a petroleum engineer with Layton Oil Co., Independence, Kans.


CONCENTRATION OF STP, lb./bbl.
CONCENTRATION OF STP, % by wt.
Solid precipitates from solution
TEMPERATURE, °F.
CONCENTRATION OF STP, lb./bbl.
CONCENTRATION OF STP, ppm x 10³
% SODIUM CHLORIDE

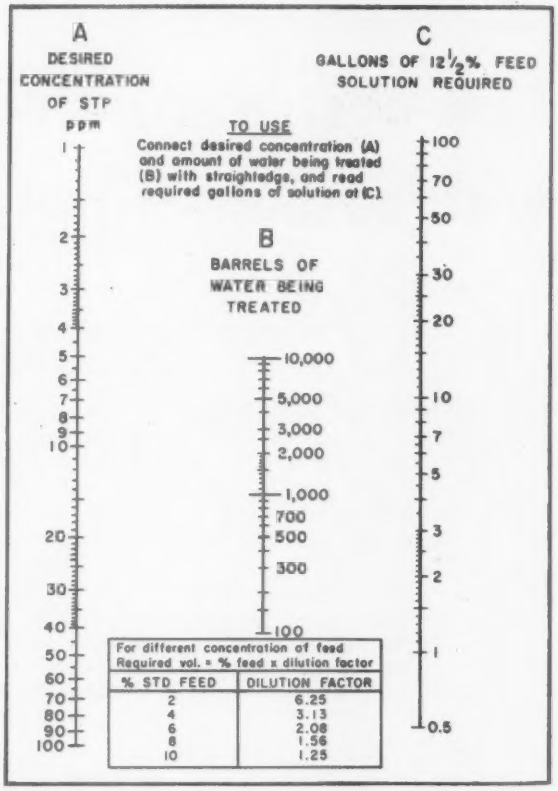
SOLUBILITY OF STP (sodium tripolyphosphate) varies with other solutes in the solution, and to a limited degree with temperature. Fig. 1, at left, shows the amount of STP that can be put in solution in fresh water at various temperatures. On the right, Fig. 2 gives the approximate solubility of STP in sodium chloride solutions.



OIL-FIELD BRINES frequently contain calcium and magnesium as well as sodium ions. This curve shows the approximate effect of these ions on the solubility of STP. Fig. 3.



INCREASED INJECTIVITY of a Kansas water flood due to the use of STP is shown by this chart covering a period of less than 1 year. Injectivity increased 72%. Fig. 5.



EASY WAY to find the amount of sodium tripolyphosphate feed solution to get a desired concentration is to use this alignment chart. Details are described in the text. Fig. 4.

an oil-field brine increase. Other salts affect the solubility of STP, but the salts of sodium, calcium, and magnesium are the main ones found in reservoir brines.

Method of treatment. Both slug and continuous injection methods have been used successfully. The original field test was started as a continuous injection treatment and has been continued as such. Other distribution systems that were known to be particularly dirty from iron oxides and other insoluble precipitates were given a concentrated slug of STP dissolved in fresh water to clean the tubing and sand face of the well before beginning continuous injection of STP.

Before STP treatment is begun, a sample of the water to be treated should be obtained and the amount of STP that can be held in solution without precipitation should be found. Precipitation of STP does not mean that it is coming out of solution in the reverted form of an orthophosphate. It simply means that the solubility of STP has been exceeded for that particular temperature and salinity.

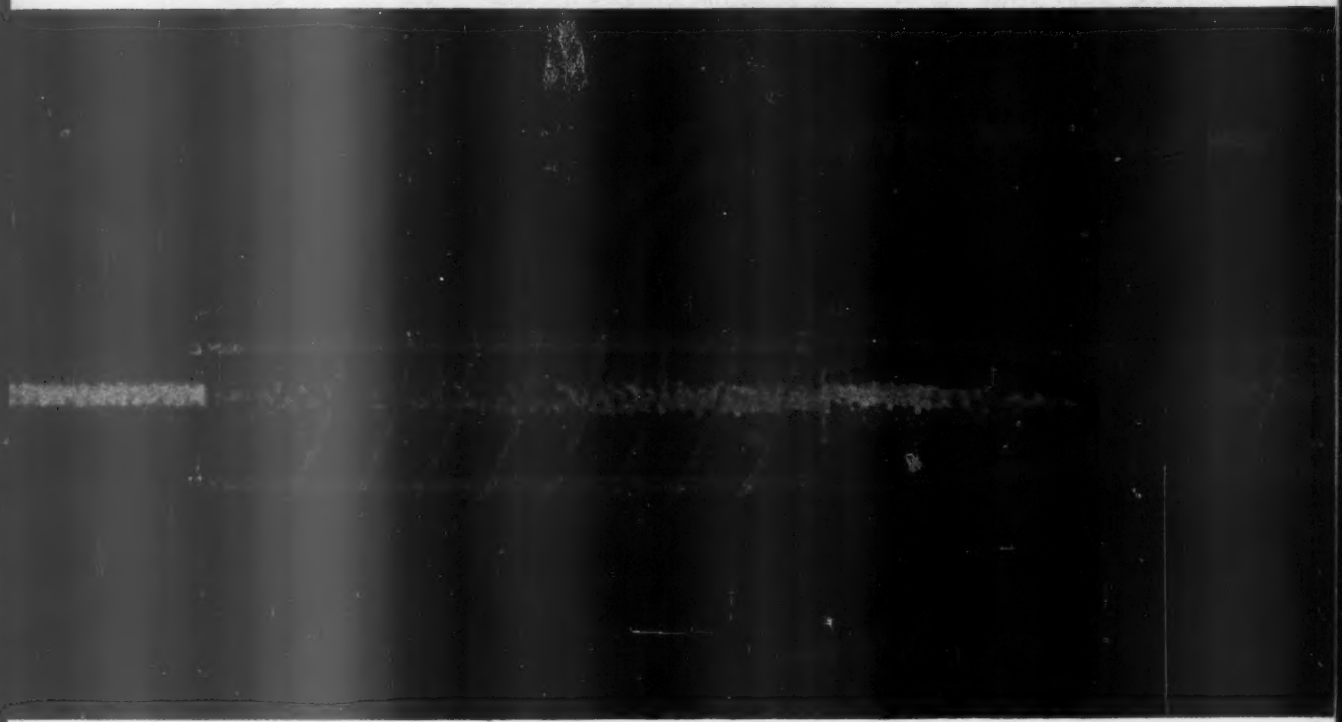
To each of several samples of the water treated, increasing amounts of a fresh-water solution of STP should be added until a a series of increasing concentrations is obtained. The most concentrated solution should soon show signs of precipitation. The solutions should be agitated thoroughly and allowed to stand.

At the end of 24 hours the conditions of the test solutions should be noted. They will show the maximum concentration of STP that can be used without fear of plugging from precipitation. If the reservoir water is markedly different from the injection water, it is desirable to check the effects of STP on samples of the produced brine to assure complete compatibility.

As discussed in an earlier report,[2] a definite concentration of STP is required to produce a reversal of the natural wetting tendencies of the crude oil being produced. To illustrate let us assume that capillarimeter tests showed 20 p.p.m. STP produces the maximum water-wet tendency for a particular crude-oil-brine system and that 100 p.p.m. STP will remain in solution in the injection water or produced brine for 24 hours. This means that the addition of 25 p.p.m. would insure the maximum effect and would be well under the critical concentration at which precipitation would occur. Stronger, more concentrated solutions may be desirable at the outset of the treatment because of the accumulations of material in distribution lines and wells. This consideration led to the use of slug treatments for obtaining a rapid cleanout, followed by continuous injection.

A nomograph was designed to aid in finding the amount of STP feed solution needed to give the desired concentration of STP in the injection water (Fig. 4). After the desired concentration of STP is de-

What a tough way to come into the world!



The piercing operation is one of the first steps in creating seamless tubing from a solid section of steel. After we set the hot steel billet in place, we ram it. Spin it. Push its insides out. And stretch it into a tube many times longer than the original piece of steel.

Consider the grueling way USS National Seamless Pressure Tubes are made and all the rigid tests to pass before we'll ship. You can see why they are the strongest, safest refinery tubes you can buy. Contact your National Tube Distributor for USS National Seamless Pressure Tubes. *USS and National are registered trademarks*

This mark tells you a product is made of modern, dependable Steel.

National Tube Division of United States Steel

Columbia-Geneva Steel Division, San Francisco
Pacific Coast Distributors
United States Steel Supply Division
United States Steel Export Company, New York

termined by the capillarimetric method and checked against the brines and injection water to assure compatibility, this value is located on Scale A. A straightedge is placed across the graph connecting this concentration and the amount of water being treated, Scale B. The amount of STP solution required is read on Scale C. This amount then is multiplied by the factor corresponding to the concentration of the STP feed solution used.

The slug treatment can be varied to suit the operator and available facilities. A general treating procedure would entail pumping about 100 bbl. of fresh water containing about 0.5% STP into each injection well being treated. This concentrated solution should be allowed to remain in the well for 12 to 24 hours before continuous injection is resumed with 25 to 50 p.p.m. STP. The advantage of slug cleaning became evident when some injection systems showed almost immediate increases in injection rates, while others did not show the effects for some time. Monitoring the water at some well-heads showed that all the STP had been complexed by the time it reached the well.[3] These wells usually were extremely dirty and required special cleaning, before significant results were obtained. Usually wells of this type required continuous treatment, as shown by a decrease in injection rates when the addition of STP was temporarily stopped. These treatments have been used successfully in a wide variety of oil-producing formations and injection waters.

Field Examples

The water-input wells of one flood in the Bartlesville sandstone at an approximate depth of 1,300 ft. were taking water at a rate of 10-50 b.p.d. at pressures ranging from 700 to 750 psi. These wells were treated by pumping 100 bbl. of fresh water containing 5,000 p.p.m. (0.5%) sodium tripolyphosphate into the wells. They were shut in for 16 hours to permit maximum reaction of the chemical before being reconnected to the injection system that was being treated with 25 p.p.m. STP. The cleanout procedure and subsequent injection of STP were so effective that the injection rates of these wells increased to 200-300 bbl. per day at the same wellhead pressures. Some wells would take more water but were restricted by metering valves to their alloted quotas.

Another project producing from the Bartlesville formation was originally developed as a pilot flood; later was incorporated as an integral part of a larger flood. After several years injection rates began to decrease gradually until the wells would not take the produced brine as fast as it was being produced, nor could optimum injection rates for the wells be maintained. After testing the brine and injection water, an STP injection system was connected to the intake line of the main pumps and was regulated to inject STP in fresh water at such a rate that the total water pumped into the distribution system was being treated with 25 p.p.m. STP.

Within a few days an increase in injection rates was noted with an accompanying decrease in pressure. The water-injection rate continued to increase until it was nearly doubled at the end of 1 years' treatment. This project had been near the economic limit of oil production, but increased water-injection rates and reduced pressures made it possible to continue disposing of salt water in the flood.

Sodium tripolyphosphate has been used successfully with a wide variety of producing formations and injection waters. These include the Bartlesville, Deese, Peru, Red Fork, Squirrel, Yates, and Wayside producing formations, and subsurface brines from the Arbuckle, Mississippi chat, and Roubidoux formations, and surface waters. Practically all combinations of these formations and brines have been successfully treated with STP. Most of the treatments have been in brine systems because they more urgently needed remedial treatments.

Fig. 5 shows the effect of 25 p.p.m. STP on the injectivity of a salt-water flood in Kansas. An immediate and sustained effect is shown in this figure by the increase in injectivity.

Don't overtreat. Over-all improvement in water-injection systems as a direct result of the use of sodium tripolyphosphate in treating water cannot be disputed. However, a few precautions are necessary to prevent the harmful experience of overtreating.

An overtreatment with STP generally will result in precipitation of the excess chemical as a white solid that accumulates near places where there is turbulence in the flow system, such as behind meters, reducers, or other pipeline restrictions. Extreme overtreatment has caused enough STP to precipitate to plug filters and centrifugal pumps. If this condition is noticed early enough it is a simple matter to put the STP into solution by reducing the treatment and by adding citric acid to the water. Some operators slug their entire water-injection systems periodically with citric acid to remove any phosphate precipitates before they become injurious.

Phosphates are fertilizers and as such are attacked by many types of bacteria. Therefore, only a few days' supply of solution should be mixed at a time to minimize bacterial growth.

Best results will be obtained by following these suggestions:

1. Optimum concentration should be determined for each injection system being treated.
2. Maximum compatibility of STP with brine injection water should be determined.
3. Compatibility of STP with other treating chemicals should be determined.
4. STP should be dissolved in fresh water in small batches, and this concentrated solution metered into the injection system.
5. Extremely dirty distribution lines and wells should be cleaned before treatment with STP.

Acknowledgments

The work reported here was performed with the cooperation of Layton Oil Co. of Independence, Kans., which supplied many of the wells and test properties. The authors also are indebted to Monsanto Chemical Co. for supplying the sodium tripolyphosphate used in the tests and to J. P. Powell of the Treat-Rite Water Laboratories, Inc., of Nowata, Okla., who supplied valuable suggestions and field data used in interpreting the field experiments.

References

1. Dunning, H. N., and Johansen, R. T., "Measurement of Crude-Oil Wetting Tendencies": Pet. Engr., Vol. 30, p. B-26, July
2. Johansen, R. T., and Dunning, H. N., "Relative Wetting Tendencies of Crude Oils by Capillarimetric Method": Bureau of Mines Rept. of Investigations 5752, 1961.
3. "Determination of Total Phosphate and Metaphosphate in Brines from Producing Oil Wells": Bradford Laboratories, Hagan Chemicals and Controls, Inc., Pittsburgh, Pa.

Subsurface hydraulic pumping

BY JOSEPH ZABA

HYDRAULIC PUMPING originated with the idea of lifting oil without using mechanical linkage. This would mean the elimination of all the complications of a mechanical system, and hydraulic methods would be used to transmit power.

Several approaches have been used to find a practical application of this idea.[1] Some units were built using the principle of a jet pump, which transfers kinetic energy of a high-velocity stream of driving fluid to the pumped stream in contact with it.[2] Systems were tried in which two fluid columns were used as pressure-transmitting media. The subsurface pump was made to reciprocate by alternate application of the pressure to the two columns.

The method which proved itself in actual field application and gained general acceptance energizes the subsurface production unit by a continuous, one-direction flow of the high-pressure power fluid supplied from the surface. The subsurface unit consists of a reciprocating hydraulic engine directly connected with the pump. The method was first used commercially in California around 1930. Increasing depth of pumping contributed to widening of its acceptance.

A subsurface hydraulic pumping system of the type mentioned above consists essentially of four parts: (1) power-fluid conditioning and supply, (2) the surface power plant, (3) piping to transfer the high-pressure power fluid to the subsurface unit, and (4) the subsurface production unit.

The power fluid. The subsurface hydraulic engine is a precision machine built to close tolerances. Therefore, clean power oil free of sand and other abrasives is needed. Since lease crude is usually used as the power fluid, and since the power oil exhausted by the engine usually returns to the surface with the produced fluid, facilities must be provided for continuous cleaning of the power fluid.

The amount of conditioning needed varies widely, depending on produced-fluid characteristics. There are cases where the produced oil is used as power fluid with no special cleaning facilities provided. This is possible where gas separation is efficient and the produced oil is clean and free of abrasives. On the other hand some crudes need elaborate cleaning and settling facilities.

Good gas separation is of first importance. Oil from the treater or the separator enters the "boot" which is a vertical pipe 6 in. in diameter or larger, with an enlarged section at the top. In the boot, installed next to the power-oil tank, additional gas separation takes place. Oil from the bottom of the boot goes to the bottom of the power-oil tank through a spreader.

If no boot is used a degasser section is provided in the top of the power-oil tank. Oil enters this section first then goes to the bottom of the tank through a flume and a spreader. Oil is drawn off to the power plant from near the top of the power-oil tank. Opinions on the needed size of this tank vary. Some operators consider 1 bbl. of power-oil tank storage for each barrel per day power-oil requirement as a satisfactory storage and surge capacity.

A development of the last few years is the so-called "closed system," discussed later, in which clean power oil is circulated to and from the subsurface engine without coming into contact with the produced fluid. This eliminates the need for power-oil cleaning facilities.

Surface power plant. A central surface power plant usually supplies the power fluid to several wells. The plant consists of a high-pressure triplex pump, engine, manifold, and necessary controls and metering devices.

A charging pump is provided to assure continuous supply of fluid to the triplex. This prevents gas from coming out of solution within the cylinders of the triplex pump.

Manifold and lines. Standardized sectional manifolds are used for distribution of the power oil from the triplex pump to the individual wells. The sectional arrangement permits adding new wells to the plant without disturbing the portion of the manifold already installed. Proper clamping of the manifold is important to prevent damage due to vibration.

Each portion of the manifold serving one well is provided with a gage and control valves. Pulsation of the gage indicates the stroking conditions of the subsurface unit. The operation of the subsurface unit is controlled by throttling of the power fluid. A manually operated throttling valve may be used or an automatic constant flow controller may be provided which maintains the desired rate of flow regardless of well's pressure requirements. A second valve is used to completely shut off the power fluid.

Liquid meters are installed within the manifold to measure the flow of the power fluid to one well at a time. Soluble plug injectors are included for introducing of plugs to remove paraffin from the power-oil lines.

The size of the surface portion of the power-oil lines varies from 1 in. up, depending on volumes to be handled, properties of the power fluid, climatic conditions, and distances to the wells. Sizes and arrangement for the conductors for power oil from the wellhead to the subsurface unit depend on type of the system used.

Subsurface hydraulic pumping system will be discussed in following parts of this series.

References

1. C. J. Coberly, "Hydraulic Power Applied to Oil Well Pumping": Drilling and Production Practice, API 1935, p. 79.
2. M. P. O'Brien and J. E. Gosline, "Application of the Jet Pump to Oil Well Pumping": Prod. API 1933—Proc. Bulletin No. 211, See also The Oil and Gas Journal, May 25, 1933.

Butomerate process

. . . Something new in upgrading hydrocarbon fractions

BY HILLIS O. FOLKINS AND ELMER L. MILLER, Pure Oil Co.

A NEW PROCESS and catalyst for the isomerization of n-butane has been developed by Pure Oil Co. The new process, "Butomerate," complements the pentane - hexane Isomerate[1] process for upgrading light-hydrocarbon fractions into high-performance gasoline blending stocks.

The Butomerate process is centered around a newly developed solid catalyst which has high isomerization activity at low temperatures. With this catalyst, n-butane is selectively isomerized to isobutane at near equilibrium yields. The process operates most efficiently in the 300°-500° F. temperature range.

Alkylation important. Alkylate from isobutane, along with other branched - chain paraffins obtained by isomerization, is playing an important role in the blending of today's high-octane and low-sensitivity gasoline. While the products from pentane and hexane isomerization are used as is in motor fuels, isobutane is most advantageously used as a reactant in the production of alkylate.

An indication of the importance of alkylate in refinery operations today is the fact that some refiners are using as much as 35% alkylate in their premium and superpremium gasoline blends. To meet this demand, alkylation - unit installations are increasing at a greater relative rate than crude capacity, as shown in Table 1.[2] In 1957, alkylation processing was equivalent to 3% of daily crude runs while the estimate for 1961 is 4.2%.

Actually, the demand for alkylate in motor fuels is greater than indicated by the increases in alkylation capacity because the declining market for aviation alkylate created large supplies of alkylate which were quickly absorbed in gasoline.

Improved fuels. The reason for the increase in alkylation demand and the potential of branched-chain paraffins as high performance motor fuel components is apparent from Table 2. These typical data illustrate how the inclusion of alkylate in motor fuels improves road performance at a given research octane level.

Alkylate actually has a negative sensitivity and since it is clear burning and does not cause rumble, it is an ideal fuel component. With the increasing demand for alkylate more refiners are using propylene as well as butylenes in their alkylation feeds. This has created a marked imbalance in the isobutane-olefin (butylene and propylene) feed needed for alkylation. Table 3 illustrates this situation by considering the composition of a typical C_4 and lighter effluent from a fluid catalytic cracking unit, the principal refinery producer of isobutane and olefins.

Assuming alkylation of butylenes only, the isobutane to butylene ratio of 0.75 shown in this table is far below the paraffin-to-olefin fresh-feed ratios of around 1.2 or higher generally required for commercial units. If the olefin charge is augmented with propylene or amylenes, the shortage of isobutane is even more marked.

Because of this deficiency additional isobutane must come from (1) n-butane isomerization, (2) from natural gasoline, or (3) by purchase from an outside source, if increased utilization of olefins as alkylate feed is to be realized.

TABLE 1—ALKYLATION GROWTH RELATED TO CRUDE CAPACITY
(Daily capacities, U. S.)

Year	Crude (1,000 BPSD)	Alkylation 1,000 BPSD	Alkylation Per cent of crude
1957	9,300	280	3.0
1958	9,400	308	3.3
1959	9,900	359	3.6
1960	10,000	398	4.0
1961 (est.)	10,100	420	4.2

TABLE 3—PRODUCT-GAS DISTRIBUTION FROM AN FCC CATALYTIC CRACKING UNIT

	Mole %
H_2	17.8
CH_4	12.7
C_2H_4	4.3
C_2H_6	5.7
C_3H_6	15.0
C_3H_8	9.6
i-C_4H_{10}	12.5
i-C_4H_8	4.8
n-C_4H_8	11.9
n-C_4H_{10}	5.7
Total	100.0

TABLE 2—COMPARISON OF OCTANE RATINGS WITH 3 ML. TEL ADDED

	Research octane (RON)	Motor octane (MON)	Sensitivity	Road octane (modified Uniontown)	Road appreciation (mod. un.-RON)
Catalytically cracked gasoline	99.0	87.3	11.7	97.5	−1.5
C_5 isomerate	105.0	106.0	−1.0		
Reformate (100°-400° F.)	100.1	91.6	8.5	99.5	−0.6
50% isomerate, 50% reformate	96.0	91.0	5.0	99.0	+3.0
Alkylate	103.0	104.5	−1.5	107.5	+4.5
Polymer gasoline	100.1	86.0	14.1	96.1	−4.0
44% alkylate, 32% straight-run, 24% polymer gasoline	97.9	94.0	3.9	98.9	+1.0
32% alkylate, 15% straight-run, 53% reformate	100.0	94.0	6.0	100.0	0.0

EYE OPENER!

The facts about transistorized 2-way radio

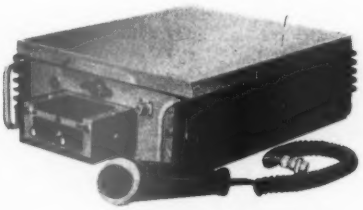
(FROM THE LEADER IN RADIO—RCA)

If you're cautious about specifying transistorized 2-way radio for your business . . . if you don't have full facts on the newest developments in radio communications equipment . . . you'll want to read this "Best Seller" by RCA. It's a fact-filled booklet that delves inside the "LD" (Low battery Drain) Mobile Radio; shows you why the "LD" gives you all the advantages of transistorization at a price comparable to all-tube equipment. Transistorized—yet easily serviced. Miserly in power consumption—yet generous in performance.

Check These Important Sections:

- How 2-Way Radio Finds "Hidden" Profits
- Inside Story on the "LD"
- Why Transistors?
- Nationwide Servicing

Read all about 2-way radio. You'll see why the new "LD" is today's best buy! Send coupon for your copy of this informative booklet.



RCA

The Most Trusted Name in Radio

RADIO CORPORATION OF AMERICA

RADIO CORPORATION OF AMERICA
Telecommunication Center, Dept. WD-89
Meadow Lands, Pa.

☐ Please send me FREE BOOKLET on the new "LD" Mobile Radio.

☐ Have RCA Communications Specialist contact me to discuss today's best value in 2-way radio.

NAME_____ TITLE_____

COMPANY OR ORG_____

ADDRESS_____ PHONE_____

CITY_____ COUNTY_____ ZONE_____ STATE_____

The rapid increase in petrochemical production is creating greater opportunities and demands for specific hydrocarbons or mixtures as raw materials. A growing potential for isobutane is its dehydrogenation to isobutylene for the production of butyl rubber, isoprene, and other chemicals.

Catalyst Activity

In the early stages of our work on butane isomerization a catalyst was developed which was very effective in producing isobutane at temperatures in the range of 700°-850° F. However, since the thermodynamic equilibrium for isobutane formation is much more favorable as the temperature is lowered, our program was directed toward a catalyst composition that possessed high enough activity to operate efficiently in the range of 300°-500° F. Here equilibrium mixtures contain around 55 to 65% isobutane, as shown in Table 4.

As a result of our studies, a stable and rugged catalyst was developed which produces isobutane at near equilibrium yields in this low-temperature range. The Butomerate catalyst is a specially formulated and activated composition containing a small amount of nonnoble hydrogenation metal on a high-surface-area support. The cost of the catalyst is much less than isomerization catalysts built around noble metals.

Typical results obtained in a bench-scale flow reactor system over this catalyst using n-butane containing around 1.0% isobutane as charge are shown in Table 5 and Fig. 1. The data show that isobutane concentrations of 60% or higher are obtained at temperatures as low as 250° F. and that the catalyst operates either at atmospheric or elevated pressures and in the presence or absence of recycle hydrogen.

However, at atmospheric pressure side reactions tend to come into play as close approach to equilibrium is attained. Therefore, the use of hydrogen and greater than atmospheric pressures are recommended for commercial application.

The Process

The Butomerate process resulting from these studies operates with hydrogen recycle at elevated pressures in the temperature range of 300°-500° F. to improve the already high selectivity, to accommodate higher throughputs in reactor and recovery sections, and to guarantee long processing cycles.

The process is illustrated by the simplified flow sheet shown in Fig. 2. Although hydrogen recycle is employed, the hydrogen to n-butane ratios are much lower than those used in pentane and hexane isomerization processes. This low hydrogen recycle rate is a large factor in minimizing the size of the reactor, compressors, and some recovery units.

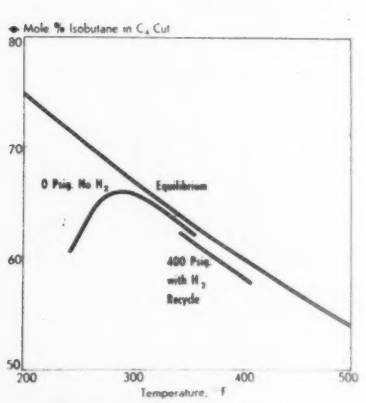
Moreover, since isobutane yields are inversely proportional to hydrogen recycle rates, it is important to maintain hydrogen-butane ratios at as low a value as possible, com-

TABLE 4—NORMAL BUTANE-ISOBUTANE EQUILIBRIUM[1]

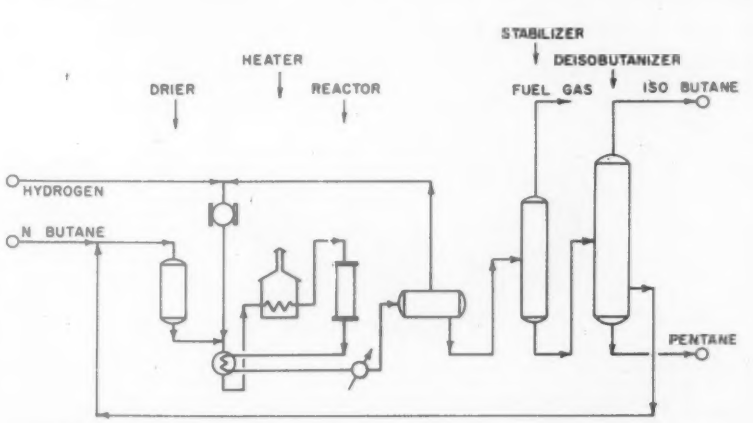
Temperature (°F.)	Mole % isobutane
200	75
300	67
400	60
500	54
600	49
700	45
800	42
900	39

TABLE 5—ACTIVITY DATA

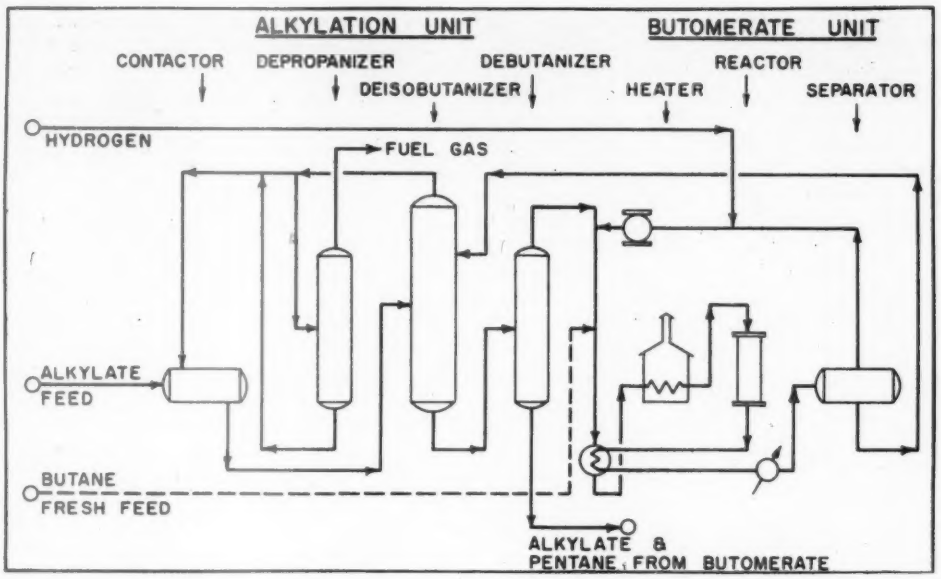
Run	1	2	3	4	5
Temperature, °F.	250	300	350	350	400
Hydrogen recycle	no	no	no	yes	yes
Pressure, psig.	atm.	atm.	atm.	400	400
Product distribution, mole %:					
Methane	3.5	4.2	4.5	2.1	1.4
Ethane	0.4	1.9	1.9	0.4	0.2
Propane	1.3	1.6	2.9	0.5	0.5
Isobutane	58.1	60.5	56.1	59.9	57.1
n-Butane	36.1	31.0	33.7	36.8	40.6
Pentane	0.6	0.8	0.9	0.3	0.2
i-C_4 content of butane cut, mole %	61.7	66.1	62.5	61.9	58.4
i-C_4 yield, mole %	57.7	60.1	55.7	59.5	56.7
Approach to equilibrium, %	86.3	98.5	98.7	97.8	97.3



CATALYST ACTIVITY as shown by approach to equilibrium. Fig. 1.



BUTOMERATE PROCESS requires hydrogen recycle, but the hydrogen to n-butane ratios are much lower than those used in pentane and hexane isomerization. Fig. 2.



BUTOMERATE combined with alkylation allows for economies of construction and operation. For example, common stabilizing and fractionating towers may be used for both units. Fig. 3.

patible with reduced side-reaction and no fouling of the catalyst under processing conditions.

Stable catalyst. The fact that the Butomerate catalyst has the unique characteristics of isomerizing butane for extended periods in the absence of hydrogen points to the stable nature of the catalyst which permits processing at a minimum of hydrogen recycle. The function of hydrogen is to prevent a slow fouling of the catalyst by strongly adsorbed intermediates or impurities.

Since the process operates in the low-temperature range of 300°-500° F. where no thermal or catalytic degradation reactions occur, there is no buildup of coke on the catalyst. Thus, the combination of catalyst character and low temperature of operation results in a process of long process cycle life with no loss in isobutane yields.

Operating under typical conditions, the catalyst is very selective. The amount of C_3 and lighter hydrocarbons formed at conversions close to equilibrium is around 1.5 wt. %. About 0.5% of the n-butane charge is converted to pentanes in which the isopentane-to-n-pentane ratio is close to thermodynamic equilibrium. Based upon the recycle of n-butane to extinction, the volumetric recovery of isobutane is around 101% and that is isobutane and pentanes around 101.5%.

Although the catalyst will accommodate a considerable amount of pentanes in the charge under butane operating conditions, provisions are made to prevent their continued buildup in the n-butane recycle stream. Since the quantity of pentanes formed is small, these products along with a small amount of n-butane are withdrawn as a bottoms stream from the recovery fractionator and used for vapor-pressure blending in gasoline.

Low pressures. The process operates at relatively low pressures in the range of 200-450 psig. The activity and selectivity of the catalyst are constant over a wide range of pressures and the optimum pressure will be governed by the economics of equipment size and product-separation efficiency. Space velocities used are in the same general area as related processes.

Alternately, if the Butomerate unit is installed adjacent to an alkylation plant, common stabilizing and fractionating towers may be used for both units. Such a combination would be especially attractive in refineries contemplating the addition of alkylation but which have a shortage of isobutane in relation to available olefins. Fig. 3 is a simple flow sheet illustrating one arrangement of a combined installation.

Normal butane from the common debutanizer tower or external source, along with hydrogen or catalytic reformer tail gas, passes to the Butomerate reactor. The hydrocarbon product, withdrawn from the separator and containing 55-60% isobutane, is fed to a common deisobutanizer tower. The isobutane from the Butomerate unit and the alkylation reactor recycle pass overhead and are depropanized before being charged to the alkylation contactor.

Since the amount of propane-and-lighter produced in the Butomerate unit is small, the size of the depropanizer will be affected only slightly by the inclusion of these gases. The small amount of pentanes produced in the isomerization reactor is withdrawn from the debutanizer with the alkylate and since it is largely isopentane passes directly with the alkylate for fuel blending.

Direct alky feed. In some instances, since isobutane yields are high in the Butomerate reactor and only a small amount of propanes and lighter are produced, it may be preferable to pump the Butomerate liquid product directly to the alkylation contactor. This arrangement may be especially attractive for butylene alkylation in HF-type units where alkylate quality is maintained with much higher concentrations of n-butane in the recycle isobutane stream than in the sulfuric acid alkylation system.[4]

By having slight excess capacity in the alkylation contactor the dis-

advantage of dilution with n-butane may be more than overcome by increased throughput and higher isobutane-olefin ratios in the contactor.

In order to prove the Butomerate catalyst for processing life, the catalyst was life tested on a pipeline n-butane charge containing around 2% isobutane for 1,000 hours at 440° F. Space velocities, pressure, and hydrogen ratios were adjusted to give an isobutane yield of around 55% per pass.

The catalyst showed a slight induction period during the first 50 hours of the run in which the isobutane yield gradually increased to a maximum and thereafter remained constant. A slight increase in selectivity was evident during the processing period. Based on this work and other studies there is every reason to believe the catalyst will perform indefinitely.

Catalyst poisons. The catalyst is sensitive to large amounts of water and sulfur. The effect of water is transient. During the pilot-plant studies, water in excess of 100 p.p.m. was at times charged to the reactor with the results that yield was depressed by around 2-3 yield per cent units. Upon redrying the catalyst with dry feed or a dry stream of hydrogen, original activity was regained. Normally, however, a drier for the feed is recommended.

The catalyst is poisoned by large amounts of sulfur. Data on the maximum sulfur concentration that can be tolerated without loss in yield have not been established. The sulfur content of the butane stream used in life tests contained around 8 p.p.m. sulfur and no poisoning effect was observed. However, since n-butane streams are often caustic or amine treated and are usually low in sulfur this is not an important factor and no preparation of charge should be necessary.

The purity of recycle hydrogen is not critical. Reformer tail gas is satisfactory. The presence of propane and lighter paraffins has no effect upon the catalyst except for the dilution effect. Small amounts of unsaturates are tolerated as they are rapidly hydrogenated over the catalyst.

Modest reactor cost. The superior activity of the Butomerate catalyst permits operation at reasonable space velocities at a temperature where equilibrium conversions are high. This coupled with the relatively low initial cost and long life of the catalyst makes the reactor section of the process a minor fraction of the cost of a commercial installation.

Since the feed preparation, recovery and recycle operation follow along conventional lines of alkylation and other isomerization processes the capital investment and operating expenses are comparable for this part of the process. The fact that the process operates at lower than usual hydrogen recycle rates affords a premium in savings in capital investments in the sizes of towers, compressors, and the like.

Acknowledgment

Acknowledgement is accorded O. L. Beber and W. T. Berg for experimental work and many helpful suggestions.

References

1. Folkins and Hennig, "The Isomerate Process": The Oil and Gas Journal, June 6, 1960, p. 120.
2. "Forecast for More Alkylation Capacity": Petroleum Refiner, January 1961, p. 209.
3. Block, Donaldson, and Haensel, "Hydroisomerization of Light Paraffin Hydrocarbons": ACS Pet. Division Preprint, April 1959, p. A-13.
4. Jones, "Advances in Catalysis," Vol. X, p. 191, Academic Press, Inc., 1958.

Cat cracking survey shows metal contamination up slightly

IN GENERAL, these data show a slight increase in metal contamination over recent surveys. Sodium contamination, in particular, has continued to increase from that reported for the May-July 1960 period. The mean value of 560 p.p.m. is up 33 p.p.m. Vanadium and nickel have also increased moderately over the previous quarter.

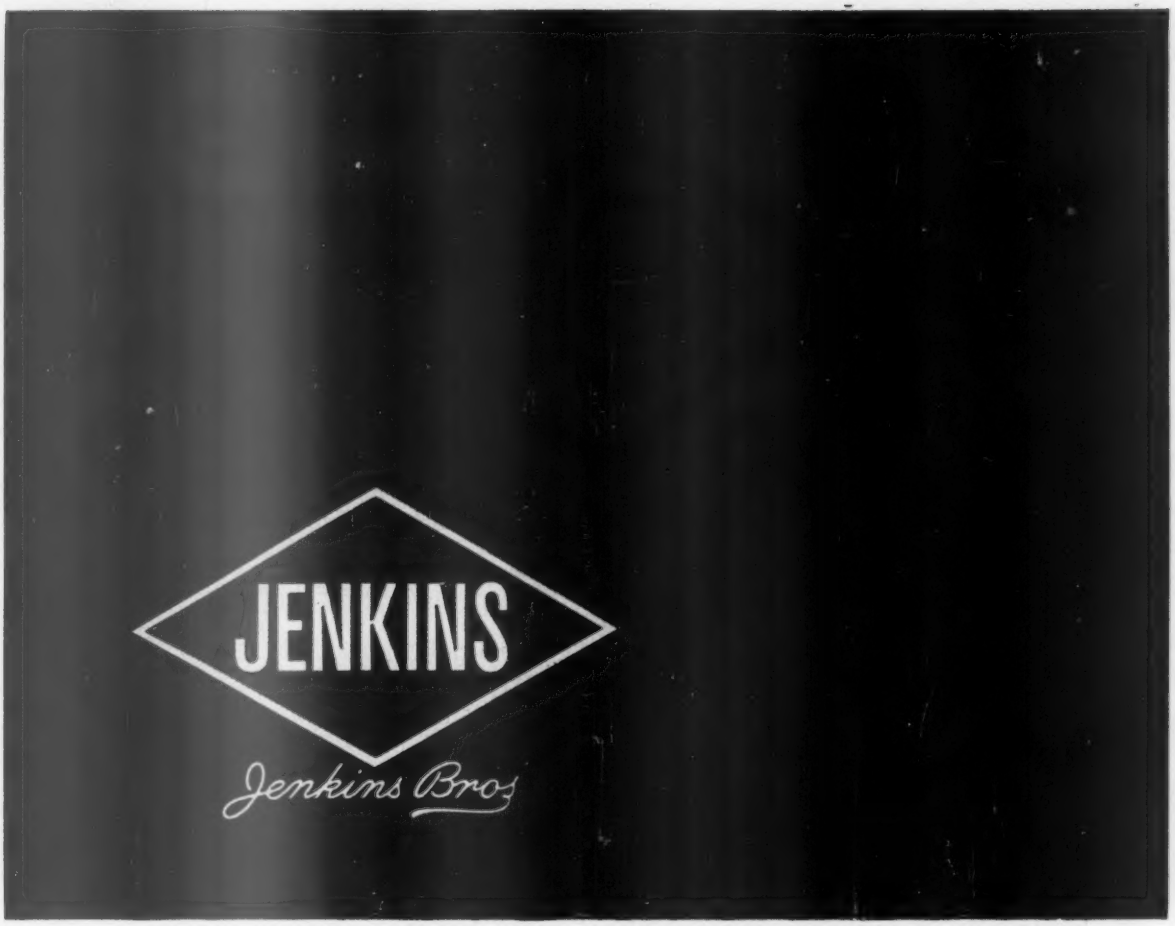
All other analyses show no significant change.

These data, based on a survey conducted by Davison Chemical Co., cover about 55% of the fluid units operating in the United States and Canada. The surveys are made quarterly.

QUALITY TRENDS IN EQUILIBRIUM FLUID CRACKING CATALYSTS

Period—	Present Quarter Nov. 1960-Jan. 1961		Previous Quarter Aug. 1960-Oct. 1960		Year Ago Nov. 1959-Jan. 1960	
	Mean	Range*	Mean	Range*	Mean	Range*
Activity, D + I	29.6	24.1-35.1	29.3	24.0-34.7	29.4	24.2-34.6
Surface area, $M^2/g.$	120	73-166	118	67-169	118	73-162
Pore volume, cc/g.	0.39	0.26-0.51	0.38	0.25-0.53	....	.....
Apparent bulk density, g./cc.	0.72	0.61-0.84	0.73	0.63-0.84	....	.....
Metal contamination:						
Vanadium, p.p.m.	192	45-824	165	35-791	195	40-945
Nickel, p.p.m.	77	15-406	72	14-369	83	15-471
Copper, p.p.m.	4	0.5-35	4	0.5-34	4	0.4-30
Sodium, p.p.m.	560	84-3,733	521	69-3,920	527	83-3,310
Iron, wt. %	0.35	0.10-1.22	0.34	0.11-1.07	0.38	0.12-1.20

*Ninety-five per cent of fluid units tested fall within these limits.



The Sign of a Real Bargain in an IRON BODY GATE

Cost-Per-Year is Lower... Initial Cost no Higher

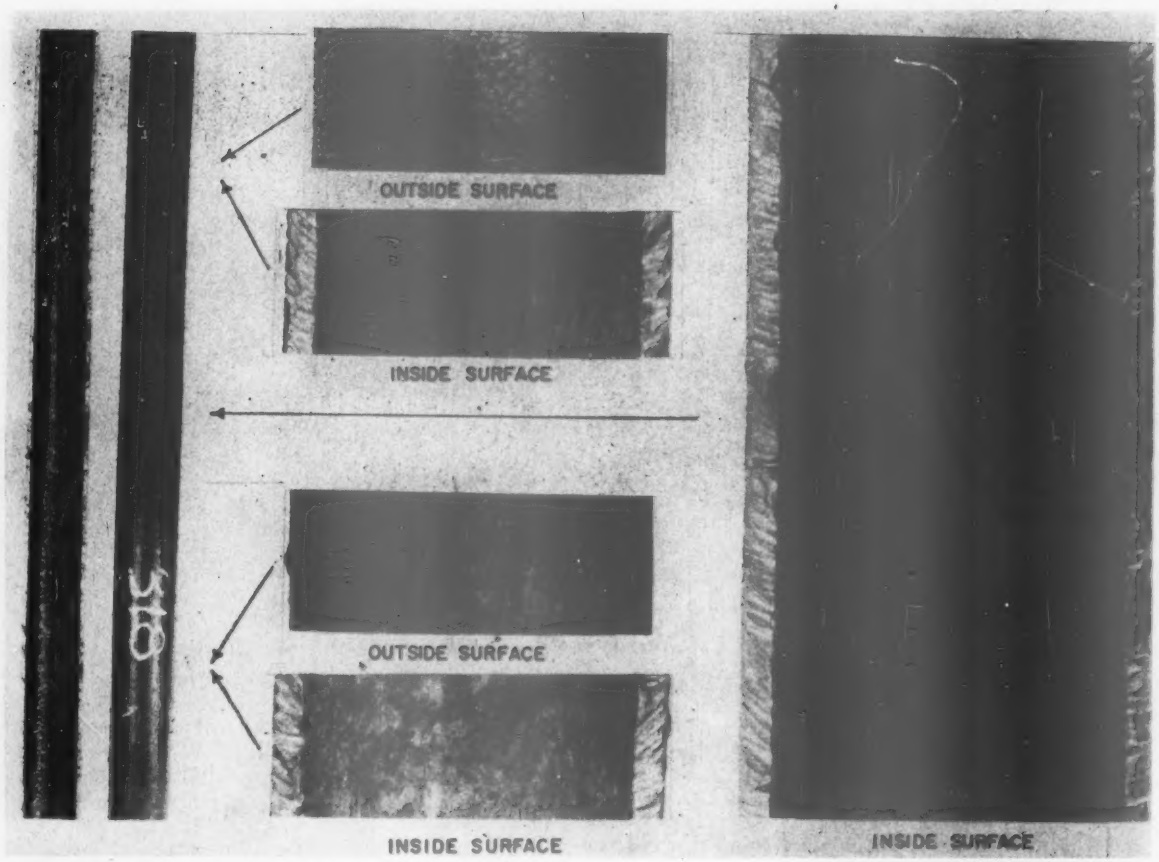
For generations extra-quality, extra-stamina Jenkins Iron Body Gates were regarded as the best buy for the money . . . even though they cost more to buy. Lower maintenance expense and extra years of service more than offset any price differential.

Today, these widely favored valves are an even bigger bargain in true value. *You pay no more for them at the start!* And you get exactly the same high quality and perfection of design for your money.

You can satisfy all your needs from the complete line of Jenkins Iron Body Valves. Jenkins Bros., 100 Park Avenue, New York 17.

AVAILABLE FROM LEADING DISTRIBUTORS EVERYWHERE

JENKINS
MOST TRUSTED TRADEMARK IN THE VALVE WORLD
VALVES



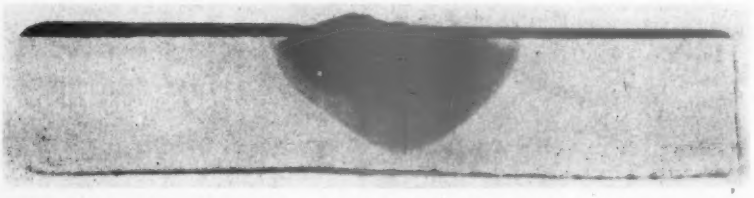
OUTSIDE AND INSIDE of a piece of 4½-in., 16.60-lb. drill pipe which has been slip-crushed. (Note the longitudinal corrosion grooving at the slip-marked section.)

Understand the "whys", and the "hows" will be easy in

Handling high-strength tubular goods

High-strength casing and drill pipe not only cost more, but failures with them are also more costly. You can lower costs if you know what pipe inspection can do.

BY JOHN A. CASNER
Youngstown Sheet and Tube Co.
Youngstown, Ohio



SECTION through wall of 4½-in., 16.60-lb. drill pipe which is believed to have been severely arc-burned by a poor welding ground on pipe rack.

FAILURE in high-strength pipe costs more than failure in lower-strength pipe.

Reason is that the high-strength pipe costs more. Besides, it is used in deeper wells which cost more to drill. And, loads in deeper wells are greater and design safety factors are slimmer.

It follows then that we must use greater care if we are to have as little trouble with high-strength pipe as we do with the lower grades.

A good example is our pipe in-

This article is taken from a paper titled, "Care and Handling of High-Strength Tubular Goods," presented at the 1961 meeting of API Division of Production's Southern District, Shreveport.

spection. To be of benefit, the inspection must reject pipe which would give poor performance; but it must not reject pipe which would give satisfactory service. Ultimately, the user must pay the price of all the rejects, so he must make sure he doesn't reject serviceable joints. Toward this end, make sure that your inspection shows these things:

On casing and tubing:

1. Damaged or defective threads that could either leak or not be made up properly (galling, high torque, excess standoff).
2. Damage or bad defects on surface of pipe or couplings.

On drill pipe:

1. Transverse cracks or gouges.
2. Crooked pipe.
3. Worn pipe.
4. Joints with local necking.

More in use. Use of high-strength tubular goods has grown rapidly because:

1. High-strength material is generally cheaper in deep wells. P-110 casing costs 25% more than N-80. However, its collapse pressure is 45% higher than N-80; its internal pressure at minimum yield strength is 37% higher; and its API joint strength is 31% higher. Moreover, widespread use of P-110 would reduce weight of casing strings; result would be lower tensile loads for upper sections to carry.
2. It reduces the wall thickness required, increasing inside diameter and improving clearance.
3. In some cases it has strength which lower grades simply cannot provide.

It is well to beware of "exotic" inspection methods which reject large amounts of pipe which has given satisfactory performance in the past. Remember that the user ultimately bears the cost of all footage which must be scrapped.

Casing and Tubing

Casing and tubing are generally expected to contain high internal pressure without leaking or bursting, carry high tensile loads without parting or leaking, and withstand high external pressures without collapsing. All these loads increase in deeper wells. And, since pressure gradients increase in many deep wells, the result is that internal pressure generally increases the most.

Threads should be carefully cleaned and inspected on the rack before running, with special attention to any damage that would cause leaks. Easily removable thread protectors should be used on the field end while the pipe is tailed into the rig to prevent damage to the pipe thread.

A high-quality thread lubricant should be used generously. This material acts as a filler to resist leaks, to prevent galling, and to reduce torque. The joint should be made up with sufficient torque to make it strong and leaktight. It is best to use the manufacturer's recommended torque or position.

When working to a recommended torque, observe each joint to be sure it is "pulled home." If you depend on torque gages alone, the result may easily be lowering in a joint which is not made up because of damage, poor size, or foreign objects under the thread. Such poor makeup can easily result in leakage, and may result in the joint parting under tension.

High-strength tubular goods may require makeup torque which is considerably higher than the lower grades. Further, makeup should be more uniform. Use power tongs whenever available.

There is some chance of damage as a result of the higher makeup forces. Tong gripping force is higher and may cause local crushing which prevents tools passing through the pipe. When crushing is very close to the pipe end, flattening may extend into the threads and under the coupling. If so, leaks may occur and joint strength will be lower.

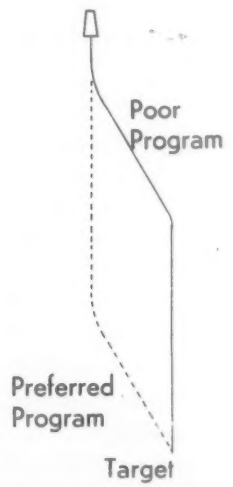
Use tong dies which have large contact area; these minimize depth and severity of tong marks.

If you must use very high torque to make up small-diameter pipe, take care to avoid bending the pipe. Set the tongs as low and close to the slips as possible; otherwise, the resulting bending forces may crook small pipe at the slips.

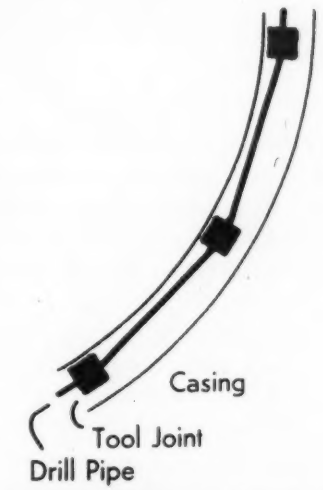
If you can avoid it, do not hammer joints which are to be broken out. Limit the hammering to tapping around the coupling or box with light blows of a flat hammer. Avoid heavy blows and do not use a ball-peen; they may introduce areas of very high cold work or may dent the coupling or box causing leakage and galling.

Casing spiders used to handle very long and heavy strings of pipe should be level to insure uniform engagement of each slip. Unlevel spiders put bending forces in the casing and may cause the slip ends to dent the pipe.

If you are to reciprocate the string during cementing, tell the driller the maximum working load which he should not exceed. Remember the loss of buoyancy caused by filling after floating-in and the acceler-

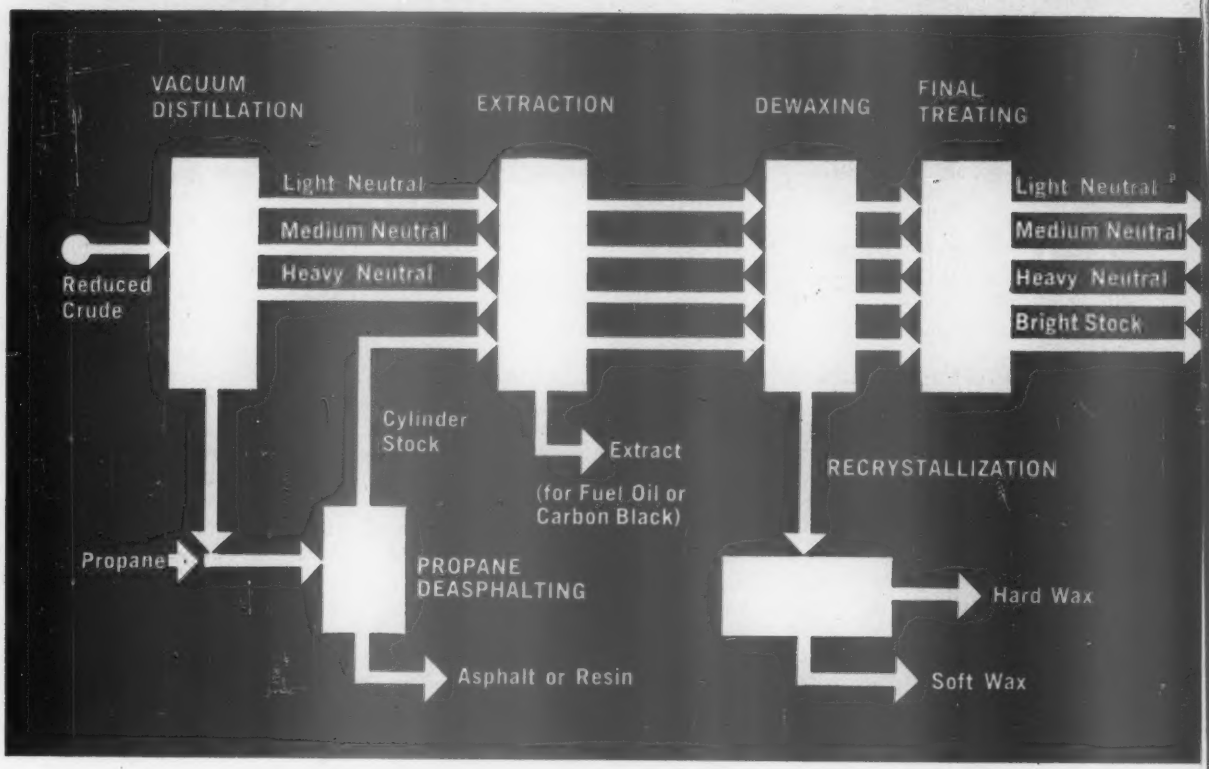


DIRECTIONAL DRILLING should be planned in such a way that whipstock points do not cause failure of the high-strength drill pipe. Whipstock points high in the hole can put high combined bending and tensile stresses in the string. Fig. 1.



LOCALIZED BENDING at the tool joints is result of high tensile load in pipe in a bend. Large-diameter pipe rubbers have same effect as tool joints here in holding pipe body away from hole wall. Result is early fatigue failure. Fig. 2.

Kellogg Lube Plants: Two Basic



PROPANE DEASPHALTING

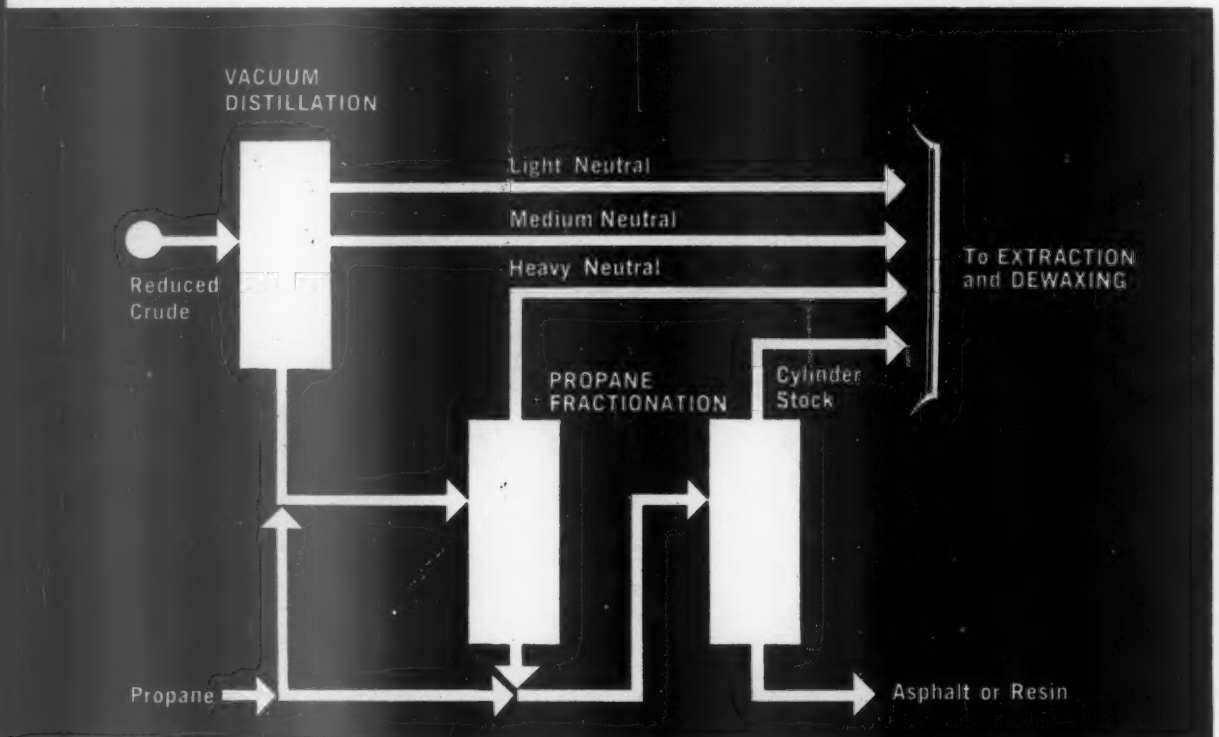
To refiners processing lube-bearing crudes, a Kellogg-designed lube plant can offer an attractive route to increased profits. To refiners currently processing lube fractions in older equipment, a Kellogg-designed revamp or expansion can mean lower operating cost per barrel.

Kellogg offers two basic routes to lube oil production, each of which can be tailored to meet individual marketing needs.

The first is based upon propane deasphalting, a continuous process designed to separate cylinder stock from vacuum tower bottoms. Cylinder stock and raw neutrals from the vacuum unit are then processed to produce blending stocks having improved viscosity index, color, and oxidation stability. In cases where waxy stocks are processed, dewaxing is employed to separate high-pour waxy materials from lube fractions. If desired, a recrystallization step can be added to recover valuable hard waxes.

The second route is based upon propane fractionation. Both heavy neutral and cylinder stock are separated from vacuum residue through use of a two-stage deasphalting sys-

Routes to Increased Profits...



PROPANE FRACTIONATION

tem. This route is recommended for client situations requiring a high yield of high quality heavy neutral.

The two basic flowsheets shown are backed by Kellogg's 30 years of experience in lube processing and embody a number of major improvements in engineering design—fruits of a continuing development program. These improvements—such as use of multiple-effect solvent evaporators and centrifugal contactors in phenol extraction units—make investment in a modern lube plant more attractive than ever before.

Since 1930, Kellogg has engineered and/or built 100 basic lube oil units. For further information on how this experience can be brought to bear on *your* lube plant needs, you are cordially invited to discuss your needs with Kellogg's lube oil specialists.

THE M. W. KELLOGG COMPANY

711 Third Ave., New York 17. *A subsidiary of Pullman Incorporated*

The Canadian Kellogg Company, Ltd., Toronto
Kellogg International Corporation, London
Societe Kellogg, Paris
Kellogg Pan American Corp., Buenos Aires
Compania Kellogg de Venezuela, Caracas
Companhia Kellogg Brasileira, Rio de Janeiro

ation loads resulting from lifting. These, plus any friction or drag, may exceed the margin put into the design.

Special attention is a must when landing long and heavy strings of high-strength tubular goods. There may be changes in longitudinal tension forces following changes in temperature and internal or external pressure. These forces must not introduce loads beyond the strength used in original design. Temperature and pressure changes are likely to be much greater in deep wells where high-strength tubular goods are used, and the design margin of safety in long strings is not usually as great as in shallow wells.

Avoid all welding on high-strength tubular goods. Welding produces damage in two ways. First, in heat-treated pipe, the heat may severely temper the steel and return it to the equivalent of low-strength steel. Second, high thermal stresses and severe metallurgical changes may cause brittle areas and cracks which fail in service.

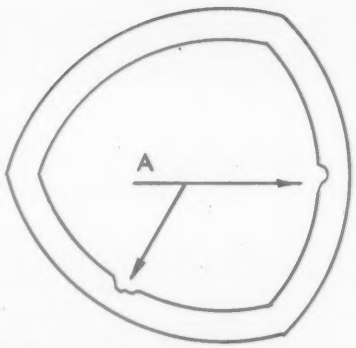
You can avoid much welding by using locking cements on the threads of shoe joints and by using latch-on, or friction-locked cementing scratchers and centralizers. If you must weld, follow the instructions of API RP 5C1 carefully.

Drill Pipe

Corrosion-fatigue cracks which wash out and twist off are the major cause of failure in grade D and E drill pipe. Generally such failures result from running the drill pipe in compression (more weight on the bit than drill collars).

This type of failure is probably less common in high-strength drill pipe since deeper wells are more carefully supervised. However, the hazard remains because most big rigs have sufficient mud-pump horsepower to take advantage of very high bit weights. Therefore, the drilling crews will be tempted to pour on the weight.

Whipstocks in deep wells can be another cause of corrosion-fatigue failures. If the first whipstocks are very shallow, eventually we will have excessive and severe bending in the drill pipe even if deflection is gradual. As the well gets deeper, the tensile loads are higher and higher on those pipe traversing the hole deflection.



SLIP CRUSHING leaves drill pipe with this flattened cross-section. High-tensile strains at the points marked "A" are followed by longitudinal grooving, since corrosion is accelerated. Fig. 3.

The drill pipe has gradual bend around the deflection under low tensile loads. As load increases, the tool joints support the pipe away from the wall of the hole and bending is concentrated at the pipe ends. The pipe is pulled in a straight line between tool joints. Large drill-pipe rubbers have the same action. Bending stress increases as tension increases until the combined cycle and static stress exceed the endurance limit. Fatigue cracks follow.

Traverse fatigue cracks almost always wash out, and then twist off. These cracks can develop and fail so rapidly that periodic inspection generally is not effective in eliminating them. Suppose we eliminate the fatigue cracks through inspection; if the causes continue, more cracks will develop and fail. These new cracks do not mean that the inspection was poor; they do show that the drilling continues to cause the fatigue cracks.

Don't pull too hard. So, to avoid fish jobs, do not run pipe in compression on top of the drill collars and do not use whipstocks improperly. When fishing is necessary, occasionally drill pipe may be pulled on too hard. Tension above the yield strength permanently stretches drill pipe; however, the cold work increases the yield strength: We must not overlook the effect of this cold work. It **increases** the longitudinal yield strength (in the direction of loading) but it **lowers** the yield strength in the direction opposite to the strain.

Small amounts of prestrain have great effect on the yield strength. This is the reason many strings of drill pipe are easily buckled and bent from running into bridges in the hole after they have been used to pull on stuck pipe.

Stretching pipe by loads above the yield strength reduces pipe diameter. The reduction is about one half the stretch on a percentage basis. For example, take a 30-ft. joint of 4½-in. o.d. pipe which has been stretched 0.3 ft., or 1%. There will be a 0.5% (0.023-in.) reduction in diameter over the full length of the joint.

There will be no local necking until the load reaches (or approaches) the ultimate load. Pipe which has once been loaded to its ultimate strength cannot ever be loaded above the load which caused the neck. As a result, then, we can test such pipe and determine the load which caused necking. We have only to pull the joint to destruction. However, we must remember that a very severe neck indicates the pipe has gone beyond the ultimate strength, and area is considerably smaller. The test load then may be lower than the service load. You might say such pipe had a memory of how high it was loaded, and proper testing would make it tell.

There are a number of other reasons not to pull too hard on the string. Joints become crooked easily because of overtension. Pipe tool joints wear faster. Joints with a local neck as a result of excessive tension should probably be discarded or put in very limited service. The reduced section is much weaker in tension, has very low ductility, and can't stand much torque.

Shallow rigs too. Slip damage and crushing of high-strength drill pipe has been a very popular subject in recent years. Certainly anything we do to prevent damage is generally worth while, but much of the emphasis has been misdirected in this case.

It would seem that slip crushing would be much worse on deep wells than shallow ones. Experience does not bear this out. Poor slips and master bushings are a big factor in slip damage, and the big rigs used to drill deep holes tend to maintain this equipment better. Moreover, the crushing load is the product of two things: weight of the drill string and acceleration when the slips are set. Drillers do not

OUR FIELD IS PRODUCING

OIL MONEY...

We're one of the biggest and most active oil banks in the country. Through experience with ventures of every type and description, we've a knowledge of oil financing that will enable us to tailor a sound, constructive plan for you.

Our staff includes some of the best informed men in the business . . . engineers with years of experience in actual oil production. You'll find them understanding of your needs, sympathetic to your problems, and an excellent source of information. And money.

With Continental's resources of more than 2¾ billion dollars (and proportionate lending power) we are in a position to handle your requirements, large or small.

We would welcome the opportunity to discuss your plans with you. Just pick up the phone and call us at STate 2-9000, Extension 2540, Chicago.

CONTINENTAL ILLINOIS NATIONAL BANK

AND TRUST COMPANY OF CHICAGO

231 South LaSalle Street, Chicago 90, Illinois

Member F.D.I.C.

Congrats and $25 to Robert W. GUTEKUNST, Esso Research and Engineering Company • Post Office Box 8, Linden, New Jersey

Joe Roughneck, backbone of the oil and gas industry, sees many a truck of tough Lone Star pipe roll onto well locations from the bayous of the Gulf Coast to the plains of the Williston basin. He knows delivery will be *on time* because Lone Star pipe is stockpiled . . . in quantity . . . in the heart of the oil country.

At Lone Star, every length of API casing, tubing, and line pipe is checked and tested through each manufacturing operation to insure strength and over-all uniformity . . . your guarantee of safe, dependable service on the job.

Neighbor, wherever you are, specify Lone Star and we both get a good deal.

© 1956 Lone Star Steel Company

Lone Star STEEL COMPANY

EXECUTIVE—SALES OFFICES
W. Mockingbird Lane at Roper • P. O. Box 12226 • Dallas, Texas
DISTRICT SALES OFFICES
912 Republic National Bank Building, Dallas, Texas
Houston, Texas | Midland, Texas | Tulsa, Oklahoma

measure acceleration; they feel the way the rig floor squats down when the slips are set and the pipe stops.

Under these conditions, poorly maintained and supervised rigs drilling shallow wells are as likely to slip-damage pipe as rigs drilling the deeper wells using high-strength drill pipe.

Pipe which is crushed by repeated setting of improperly acting slips eventually assumes the shape seen in Fig. 3 (exaggerated). Outside diameter of the pipe is reduced and no longer fits the curvature of the slips. Instead of being circular, the pipe assumes a shape of three arcs, the radius of each equal the nominal pipe radius.

The flattening produces very high hoop tensile strains at **A** and these accelerate corrosion and induce longitudinal grooves. The grooves get deeper as corrosion and crushing continue and finally fail. Such longitudinal washouts do not generally result in a fishing job, but the damage is usually costly since it occurs on the entire string, not just on a single piece.

When pipe diameter is reduced by slip crushing, there are also other dimensional changes. Actually, wall thickness generally increases some. Cross-section at the slip area is not reduced as much as generally believed. Don't confuse this action with the neck that occurs just before a tensile failure; then, both diameter and wall thickness are reduced.

The diameter reduction from slip crushing also causes longitudinal extension in the slip area. This cold work increases longitudinal yield strength in the slip crushed area as much as 8,000 to 10,000 psi.

Two elevators or one? Many drilling men would like to eliminate slips altogether. They are interested in using two elevators to handle drill pipe in the same manner as sucker rods are handled. This method may be good if it is as fast and safe as slips; however, there are problems. If it takes more time to handle the pipe, it may be no better than simply having the crews slow down and use more care in setting the slips and stopping the pipe. And, if there is any hazard of picking up the elevator with only one link engaged, then there is danger that the eccentric load on the tool joint may break it off.

To measure service. Does service life of high-strength drill pipe compare favorably in deep wells with service of lower grades in shallower wells? Yes, if service is measured on an equitable basis.

Total rotations would probably be the best measure. This scale compensates for the great range of rotary speeds (70 r.p.m. in West Texas to 400 r.p.m. in some California fields). It also takes account of drilling rates whether they be 1 or 2 ft. per hour or as high as 300 ft. per hour.

Suppose, on the basis of hours of rotation, or total revolutions, a drilling string in 18 months drills a 25,000-ft. well. This service would be roughly the same as the string used to drill 45 wells to a depth of 2,600 ft. in the same period. While the high-strength string drilled only 25,000 ft. or hole, it drilled only 25,000 ft. of hole, it in shallow wells.

Electric-arc damage. Some magnetic inspection methods pass electric current through the pipe. We must be careful that electricity does not arc between the contact probes the pipe. Remember that when you ground an arc welded to a rack full of pipe, you may be depending on good contact between pieces of pipe on the rack. If so, it can be easy to accidentally arc burn the pipe while welding.

Arc burns are especially damaging to high-strength material. The small zone of high temperature is quenched very rapidly by the surrounding cold metal. This quench action may harden and embrittle the metal and the high thermal stresses may cause cracks. These cracks propagate and fail in service.

Arc burns are more damaging than most defects which are being sought by inspection, especially if the burn is near the face of couplings or box members of integral joint pipe. The bearing face of boxes and couplings are subjected to very high hoop stresses because of makeup of tapered threads; arc burns and cracks at this point may cause failure.

Bibliography

API RP 5C1, Recommended Practice for Care and Use of Casing, Tubing, and Drill Pipe, New York, March 1959, seventh edition.

GEM
OF THE
OIL AND GAS
INDUSTRY

Oil and gas men are as exacting in pipe quality and dependability as a fashionable woman is in the fine needlework of her apparel or craftsmanship of her jewelry.

Lone Star men are more than steel-workers . . . they are accomplished craftsmen and they make Lone Star casing, tubing and line pipe with the same pride exemplified by a custom jewelist. Lone Star pipe has the quality, the stamina and the finish specified by API.

Lone Star STEEL
COMPANY

EXECUTIVE—SALES OFFICES
W. Mockingbird Lane at Roper • P. O. Box 12226 • Dallas, Texas
DISTRICT SALES OFFICES
912 Republic National Bank Building, Dallas, Texas
Houston, Texas | Midland, Texas | Tulsa, Oklahoma

Processing notes

Coking will stay around despite big coke piles

ONE OF the most widely used methods of reducing residual yields—coking—is not losing its popularity despite excess capacity which builds sizable piles of coke at some refineries.

U. S. refinery coke production jumped from 3,237,000 tons in 1955 to 5,211,000 tons last year, according to the Bureau of Mines.

The chart below shows the consumption pattern.

Most of the coke going into nonfuel uses is sold by the refiner on long-term contracts to companies which calcine the raw coke into a product for subsequent use as electrodes, carbon abrasives, and other carbon products.

However, only about 41% of the petroleum coke consumed last year in the U. S. went for these nonfuel uses. Of this, the aluminum industry accounted for more than half. Coke is used in the form of carbon anodes in the electrolytic recovery of primary aluminum.

The amount of coke burned as fuel reached 2 million tons last year, twice the 1955 figure. On a percentage basis, about 40% ended up as boiler fuel compared with 33% of the 1955 output.

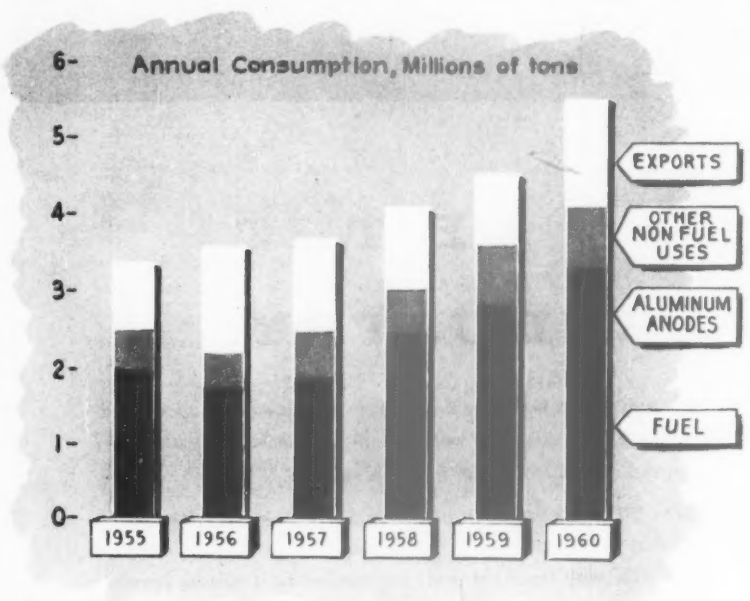
Average price paid for delayed coke as a fuel now ranges from $5 to $6 per ton. Quantity and quality of the coke have a bearing on the price—but the most important factor is its location with respect to market.

Much of coke's recent gains as a fuel have resulted from across-the-fence deals between a coking company and a user.

Over-all coke exports have been trending upward for the past 2 years and amounted to a record 1,371,000 tons last year. The amount of coke going into export is partially influenced by available supplies in the U. S. and the availability of cheap transportation. Currently these factors are making such movements favorable.

However, European refiners are becoming more interested in coking as a means of increasing middle-distillate yield. This will have an effect on the U. S. market.

Although the outlook is not particularly bright for petroleum coke as a high-profit item, the role the process plays in reducing residual yield assures that more units will be built.



COKE DEMAND has risen steadily for several years. Consumption last year was 5,481,000 tons.

COKE CONSUMPTION IN THE UNITED STATES
(Thousands of tons annually)

	1955	1056	1957	1958	1959	1960
Exports	903	1,285	1,045	881	936	1,371
Aluminum electrodes	975	1,040	1,070	1,020	1,170	1,250
Other nonfuel uses	465	480	610	725	800	850
Fuel	1,010	707	893	1,448	1,608	2,010
Domestic production	3,237	3,462	3,858	4,524	4,698	5,211
Changes in stocks	−116	−50	+240	+450	+180	−270

New sleuth detects faulty fuel combustion

A NEW SYSTEM of detecting abnormal combustion in a gasoline engine has been developed by Standard Oil Co. (Ohio).

It involves mounting a vibration pickup on the lower engine block near the front main bearing. The excessive pressure of abnormal combustion can be selected here without interference from other engine vibration.

By combining this technique with the more conventional use of pressure pickups in each cylinder of the

engine, Sohio researchers hope to learn more about how various components in a blended gasoline contribute to smooth combustion.

So far, in testing pure hydrocarbons, Sohio has found that isooctane and xylene give very smooth combustion, while toluene, often taken as representative of aromatics in fuel, is very rough.

More conventional fuel blends have also been studied. These were made using heavy cat reformate (aromatic), light cat distillate (olefinic), and light alkylate (paraffinic) with two types of tetraethyl lead. Results showed that highly aromatic or paraffinic fuels tend to give smooth combustion, while the olefinic types are most prone to surface ignition and engine roughness. The type of lead has little effect.

M. W. Feldman, of Sohio's research department, described the development at a meeting of SAE in St. Louis.

New device mixes gas streams at constant ratio

A NEWLY DEVELOPED microproportioning device is capable of injecting trace quantities of gaseous material into a flowing gas system at a constant ratio regardless of pressure, temperature, or flow variations in that system.

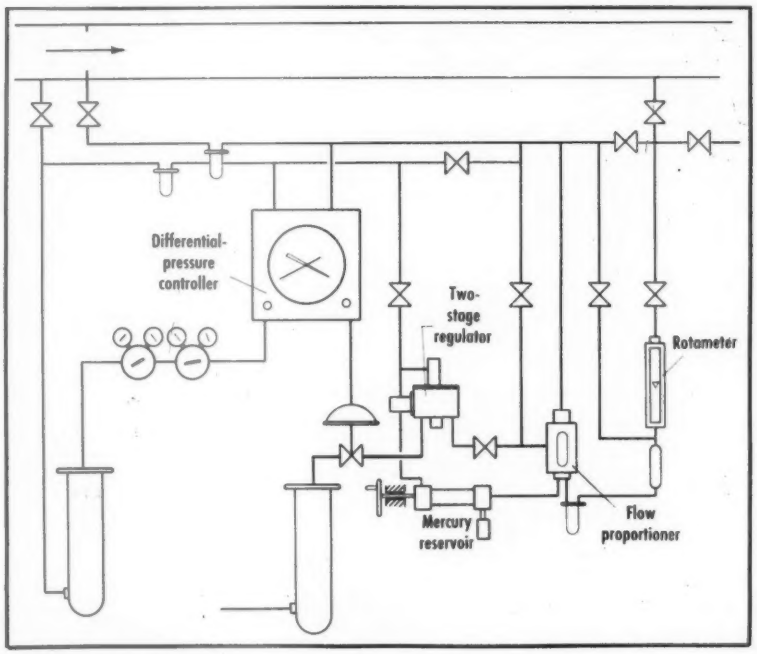
The proportion of injected gas to main-line gas can be held steady during a prolonged injection at a ratio in the part per million range. This ratio is adjustable between 1 and 5 p.p.m. in current models made by the developer, Isotopes, Inc. Employing the same engineering principles, other ranges can be obtained for specific applications.

Field and laboratory tests of the device have shown that a set ratio can be maintained within better than 10% over a span of 300 to 1,000 psi. in main-line pressure and 80 to 1,500 M.c.f. per hour in main-line flow. A ratio which has been changed for some reason can be reset within about ±2% of its original value.

The microproportioning unit is completely automatic and self-contained. It requires no electrical or mechanical power source for its operation. Pressures in the injection gas tank and in the main line provide all the necessary energy for the movement of mechanical parts in the operation of the device.

Proportionment system. This is comprised of four major components: (1) a standard pipeline orifice with associated pressure tubing in the main line, (2) a specially designed automatic, high-pressure two-stage pressure regulator which then adjusts the trace gas pressure to the proper value for injection downstream (see accompanying figure), (3) a flow proportioner, and (4) a rotameter.

Differential pressure across the orifice plate moves a device which displaces mercury in a reservoir within the flow regulator. The change in level of the mercury, through a special ararngement, causes a change in resistance to the flow of gas. In this way the flow of gas in the proportioner is accurately controlled so that it will constitute the preset fraction of the flow in the main line. The rotameter is used to visually check flow in the injector. Malfunction of the device can be detected in this manner.



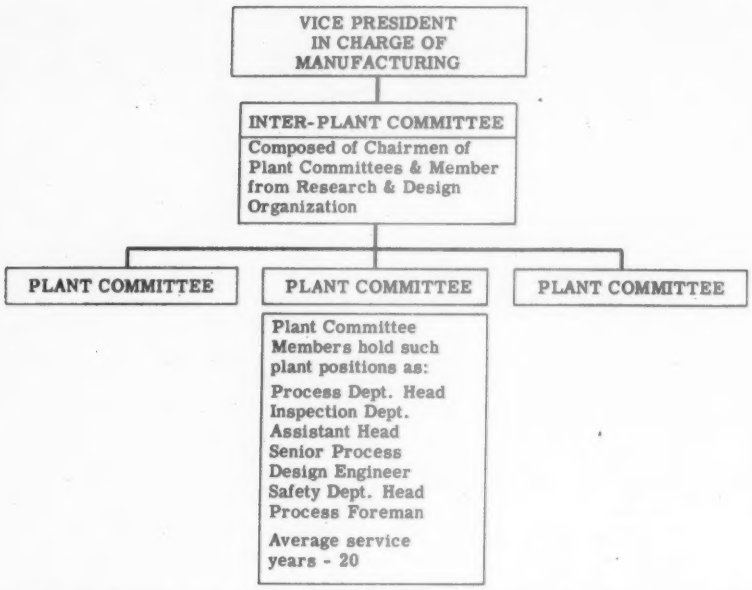
MICROPROPORTIONER injects trace quantities of gaseous material into flowing gas stream at constant ratio.

Demand for low-density polyethylene appears headed for decline

SURPLUS CAPACITY of conventional low-density polyethylene plants may be coming to an end in the next few years. A recent market estimate places demand for this product at 1.6 billion pounds in 1965. Present plant capacity is close to 1.7 billion pounds.

This represents an average annual growth rate of 7% between 1961 and 1965 as compared to a rate of 25% that prevailed in the late 1950's.

According to Vincent D. McCarthy, Director of Plastics Sales of U. S. Industrial Chemicals Co., the domestic market will look something like this: Film and sheet, 610 million pounds; substrate coating, 250 million; injection molding, 235 million; wire and cable coating, 170 million; exports, 150 million; miscellaneous, 85 million, extruded pipe, 70 million; and blow molding, 60 million; for a total of 1,620,000,000 lb.



ONLY TOP PEOPLE with experience and judgment are appointed to committees. Their decisions are respected by management and operating men alike. Fig. 1.

How committee action has reduced Humble's accident rate

BY J. N. KAYSER
AND R. W. WILLIAMS
Humble Oil & Refining Co.
Baton Rouge

EFFECTIVE safety committees making refineries safer places to work. That's the experience of Humble Oil & Refining Co., which has been operating under a committee system since 1947.

Activities of the committee are directed along the following general lines: They

... **Review startup,** shutdown, and emergency procedures.

... **Review accidents** and near-accidents.

... **Develop guides** for safe handling of flammable materials.

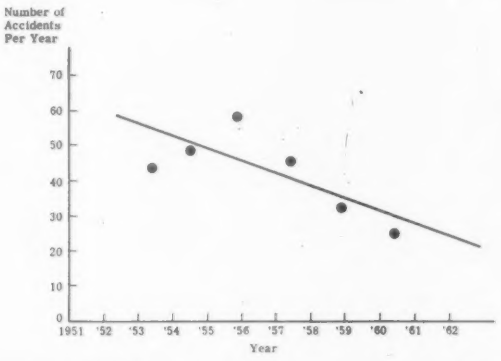
... **Review operating** problems, engineering design, and plant layouts.

Although they are advisory only, these committees are effective because they are made up of experienced and respected men. Their decisions carry weight among operating men.

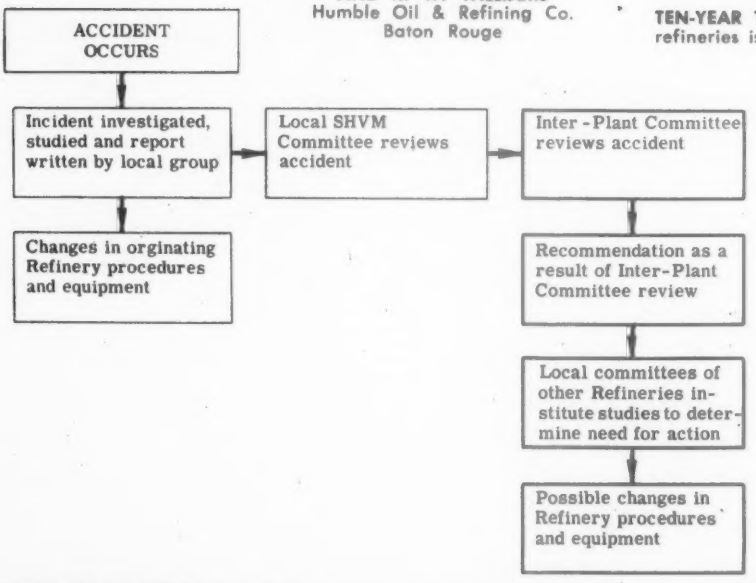
Committee organization is shown in Fig. 1. Average experience of committee members at the three larger Humble refineries is almost 20 years.

Local chairmen have generally been experienced process department heads. The interplant committee chairman has at times been an assistant refinery superintendent and is now a process department head. The committees have earned the respect of higher management as well as the respect of those seeking advice, and are thus able to fulfill their responsibilities.

Local committees are appointed by refinery general managers and report to various refinery organizations and people. In general, their recommendations are made directly



TEN-YEAR TREND in accident frequency at Humble's refineries is steadily downward. Fig. 3.



AFTER AN ACCIDENT, committees determine the cause and recommend ways to prevent it from happening again. Fig. 2.

Presented at the midyear meeting of API's refining division.

It's different! a completely new

ANODE MATERIAL

DURICHLOR 51

Developed after years of extensive research for the cathodic protection of piers, off-shore drilling rigs, heater-treaters, or any structure employed in or handling salt, brackish, or high temperature fresh water

THE RESULTS OF TESTS

DURICHLOR 51 anodes were not released for field trials until after they had passed, with complete satisfaction, extensive laboratory tests in environments known to cause either severe general or localized attack on existing materials. After all laboratory tests had proved favorable, field installations were made to test DURICHLOR 51 under actual operating conditions known to be too severe for existing metallic and non-metallic anodes. There has been no indication of any selective attack in any of the field tests reported; and in general, these tests have substantiated laboratory data. Significantly, in some cases, the DURICHLOR 51 anodes have been in service approximately one year showing no sign of selective attack in applications where other materials have failed in as short a time as two months.

THE DEVELOPMENT

The introduction of the high silicon iron alloy, DURIRON, as an anode material in 1954 extended the range of application for cathodic protection into areas where it had not previously been economically feasible. There were environments, however, in which neither DURIRON nor the molybdenum containing alloy, Durichlor, were completely satisfactory. Research was begun back in 1954 in the DURCO laboratories. The alloy that showed the most promising results as it progressed through the laboratory had been designated D-51X. When field trials were begun, the material was referred to as DURCO D-51. Now that all test data prove its merit, the material is made commercially available as DURICHLOR 51.

AREAS OF APPLICATION

DURICHLOR 51 was developed as an anode material for application of impressed current cathodic protection in aggressive salt and brackish waters, high temperature fresh waters, and in chloride containing soils where the chlorine generated at the anode surface was not free to permeate to the surrounding environment. Structures include steel support members for terminals, docks, off-shore drilling rigs and others exposed to sea water; heater-treaters, water box coolers, industrial hot water tanks, and similar fresh water applications; and pipe lines, storage tanks, well casings, and other underground structures.

THE DURIRON COMPANY, INC., DAYTON 1, OHIO

DURCO

BIG IN THE RUBBER PICTURE

The simple one-step HOUDRY DEHYDROGENATION PROCESS produces butadiene for synthetic rubber throughout the world. In addition, it can produce butene. Other mon- and diolefins may also be produced from the corresponding saturated hydrocarbons.

Capacity placed on stream in the U.S. since World War II is capable of producing very close to 50 per cent of the butadiene required by the domestic synthetic rubber industry. The HOUDRY DEHYDROGENATION PROCESS is also on stream in plants in Italy, West Germany, and Japan. Write for a full description.

*HOUDRY
PROCESS CORPORATION
1528 Walnut Street, Philadelphia 2, Pa.
*Houdry means Progress...through Catalysis

to those who ask their help. The interplant committee reports to a vice president in charge of manufacturing, and meeting minutes and recommendations are distributed to the local committees and other interested people.

Review of procedure. The work today consists largely of assuring that current, written procedures are available in all unit control houses and are kept up to date by a review at least every 3 years. Until recently, an interplant subcommittee visited the various refineries and witnessed unrehearsed emergency dry runs on several units to assure that process operators knew the procedures. This function has since been turned over to local control. In most refineries, the process departments now have a practice run on each unit, once a month, conducted by a process supervisor.

Local committees meet every week or two, while interplant meetings are held every 8 months.

Review of accidents. Fig. 2 outlines the steps in both the review of accidents and the development of recommendations, procedures, and guidance functions of the committees. An example is a recent fire at one of the refineries.

The fire resulted when oil backed up into a sewer lateral and was ignited by pilot lights in a cafeteria located in the basement of an office building. The oil in the sewer came from an overflowing crude-oil tank into which a ship was discharging its cargo. Because this incident occurred on a Sunday, the building was unoccupied, and there were no casualties. Damage to the building was extensive, however.

With the trend toward larger tankers and higher pumping rates, the frequency of overfilling is likely to increase unless some safeguards are taken.

As a result of local committee deliberations at the refinery where the accident occurred, two receiving tanks are now being used in parallel when crude oil is unloaded; and extra manpower is provided during unloading, to assure close checks on tank levels.

Developing guides. Changed or new procedures often grow out of review by the committee of accidents and near-accidents.

To illustrate this function, here is

a solution uncovered by one committee when it reviewed loading operations from shore to ship.

In the past, communication between the ship's mate and the standby operator on the dock has been by shouting. This becomes very difficult at times. As a result of a committee's recommendation, telephone jacks, connecting to the refinery switchboard, are being installed on berths at the docks. This will provide telephone communications between ship and dock when necessary.

In the past, communications between dock and tank field has been by telephone only. Two-way radios have been ordered and will be installed in each standby house on the dock.

Problems of design. Review of engineering design, plant layouts, and operating problems—the fourth committee function — is almost a routine in local committee meetings. Where standards are available and conformed to, there is seldom any question of approval. In many instances, however, strict adherence to standards is not practical. In such cases, the plant site is usually visited, and some solution is generally reached. In a few cases, proposals have to be turned down.

Communicating Information

One of the phases of the committees' work which is most important, but difficult, is impressing the need for safe practices on the man who does the work, inasmuch as a consistent 50% of accidents are caused by improper procedures. Besides usual communication channels, the following activities designed to promote process safety awareness have been sponsored by local or interplant committees:

1. Use of the written operating guides for training.

2. Unit safety surveys by process foremen or workers using check lists prepared by the committee.

3. The practice of staging emergency dry runs.

4. Holding process safety meetings.

5. Use of a series of short strip films for control-house safety discussions. These films are fairly new and depict accidents which have actually happened in Humble refineries.

FACTS FOR REFINERS

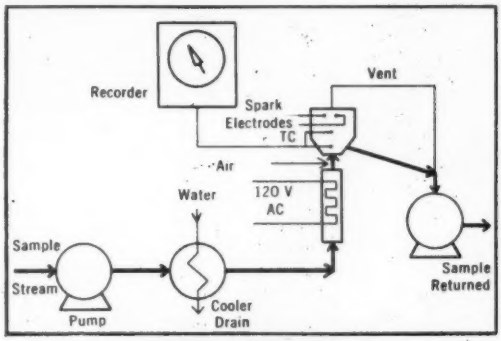
PSd

INSTRUMENTATION FOR AUTOMATION

FLASH POINT CONTROL ADDS $45,625 TO ANNUAL PROFITS

American Oil Company told the API Division of Refining at its Mid-year Meeting, that *continuous* flash point testing adds $45,625 to the annual profit of a refiner producing 10,000 B/D of distillate fuels. No. 1 fuel oil can accommodate more heavy naphtha and total production can be increased about 5% by bringing the flash point 5°F. closer to specifications*.

Controlling flash point quality to the optimum level requires continuous monitoring, in contrast to normal practice of submitting only 1 or 2 stream samples once each shift to the laboratory. The CONTINUOUS FLASH POINT RECORDER, developed by Standard Oil Company (Indiana) and licensed exclusively to PRECISION SCIENTIFIC DEVELOPMENT, automatically determines flash every 5 minutes. Results correlate with ASTM Tag Closed test (D56) within 2°, and can be read immediately, enabling operators to pin-point the most effective process adjustments to virtually eliminate off-test production.



HOW IT WORKS

The flowing sample stream is first cooled, then its temperature is slowly raised; air is injected. Sample temperature is recorded electronically prior to exposure to high voltage sparks every other second. Following flash, recording pen automatically drops; cycle ends; 2-minute cooling begins, cycle recommences.

Continuous flash point control also gives more distillate production, to meet seasonally heavy demands, without increasing crude runs and processing costs. About 2000 B/D more crude would be required to provide 500 B/D more distillates. Increasing crude runs increases costs and aggravates the problem of maintaining balanced production. Flash point control also helps reduce other refinery costs, for example, if reprocessing of off-test material is reduced by 1% of total production, savings can amount to $20 per day . . . $7300 per year.

Typical Benefits of Flash-Point Control of No. 1 Fuel Oil

	B/D
Nominal Production	10,000
Added production by 5°F. lower flash point	500
	Dollars
Differential value of added stock, per bbl.	0.25
Value of 5°F. lower flash point, per day	$125.00

Other CONTINUOUS FLASH POINT RECORDER advantages are savings in time and protection against hidden errors and contamination. Process decisions can be made promptly and blending operations speeded by virtue of the continuous record and elimination of delays. Samples are taken directly from a process line, excluding sampling errors. The recorder eliminates oral reporting of test results, avoiding transcription errors. When used to monitor bulk deliveries of products to pipe line or tankers, it safeguards against leaky valves, poor mixing and contamination.

Refiners should study how the CONTINUOUS FLASH POINT RECORDER can add to profits. Request Bulletin No. 702. Let us help solve your special problems.

*PROCESS MONITORS SAVE MONEY AND IMPROVE EFFICIENCY
S. F. Kapff and R. B. Jacobs
American Oil Co., Whiting, Ind.

Precision Scientific Development
3745 West Cortland Street
Chicago 47, Illinois

Protection Is Our Business
Asbestos Pipe Wrap Our Product

Nicolet Asbestos Pipe Wraps and **"Old Nic" Glass Wrap** are the modern armor for today's pipe lines.

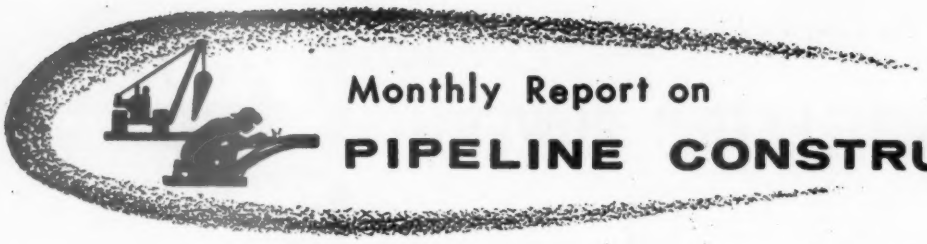
Your pipe line requirements can be completely met with either #15 "Standard", #8 "Tufbestos" or #10 "Reflecto" (the new, white, improved Asbestos Felt). Together with "Old Nic" Glass Wrap, you have absolute assurance of getting the finest and most complete line of pipe line protection products obtainable anywhere.

Write today for full specifications and samples of Nicolet pipe protection products.

Distributed throughout the United States

NICOLET INDUSTRIES, INC.

FLORHAM PARK, NEW JERSEY



Monthly Report on PIPELINE CONSTRUCTION

PIPELINE ACTIVITY reported here is compiled from surveys by The Oil and Gas Journal among pipeline companies and contractors.

This summary appears in the last issue each month. New projects are reported weekly under Pipeline Briefs.

Projects are listed in three groups—U. S., Canadian, and Foreign—and according to type of line—crude, products, natural gas, or miscellaneous.

★ The star symbol indicates the first appearance of the project in the Journal's survey.

U. S. Crude Oil Pipelines

ASHLAND OIL & REFINING CO., Ashland, Ky.
★ Project: 24-mile, 6-in., from Blaine, Ky., to Catlettsburg, Ky.
Completion: Sept. 1, 1961.

BEN FRANKLIN REFINING, P. O. Box 2007, Tulsa, Okla.
★ Project: 11-mile, 6-in., 2-mile, 8-in., Healdton to Ardmore, Okla.
Completion: Sept. 30, 1961.

CONTINENTAL PIPE LINE CO., Drawer 1267, Ponca City, Okla.
Project: 4-mile, 3-in., 18, 4-in., 68, 6-in., 323, 8-in., and 53, 10-in., Glacier System from Cutbank, Mont., to Byron, Wyo.
Status: Under way.
Contractor: R. H. Fulton & Co., Lubbock, Tex.
Completion: Feb., 1962.
Project: 20.7 mile, 8-in. crude line from Grand Isle to Golden Meadow, La.
Completion: December 31, 1961.
Contractor: Glaser Construction Co.
★ Project: 62-mile Kingfisher gathering system to Ponca City, Okla.; 8-mile, 6-in., 31-mile, 4-in., 23-mile, 3-in.
Status: Underway.
Completion: July 31, 1961.
Contractor: P. & A. Construction Co.

GILLETTE PIPELINE, INC., and **A. W. HARTWIG, INC.**
Project: A 102-mile line from Dead Horse Creek field to Casper, Wyo.
Status: Pending Wyoming Public Service Commission approval.

GREAT NORTHERN PIPE LINE CO., 175 East 4th St., St. Paul 1, Minn.
Project: 64-mile extension to the Lignite field, Burke County, North Dakota.
Status: Planned for 1961.

INTERSTATE OIL PIPE LINE CO., Box 1107, Shreveport, La.
★ Project: 11-mile, 6-in. Baton Rouge to Dixie Pipe Line near Baker, La.
Status: Planned.
Completion: Nov. 30, 1961.

MATADOR PIPE LINE CORP., Denver, Colo.
Project: 175-mile line from Burke, Bottineau, and Renville counties, North Dakota, to Cromer, Man.
Status: Pending approval of Canadian National Energy Board.

MESA PIPELINE CO., Midland, Tex.
Project: Extension of gathering system to other fields in West Texas and southeastern New Mexico.
Status: Planned.

MID-CONTINENT PIPE LINE CO., Tulsa.
Project: 9-mile, 6-in. crude oil line from Crider field to Maysville station, Okla.
Status: Planned.

NORTHWESTERN REFINING CO., Box 248, St. Paul Park, Minn.
Project: 4, 6, and 8-in. gathering lines in Glenburn field, Renville and Bottineau counties, North Dakota.
Status: Has state approval.

OVERLAND PIPELINE INC., Wichita, Kans.
Project: 4-in. gathering system in Lone Tree field, Wyo., and transmission line to connect with Plains Pipeline Division of Franklin County Coal Corp.
Status: Application before Wyoming PSC.

PURE TRANSPORTATION CO., 200 East Golf Road, Palatine, Ill.
★ Project: 12.59-mile, 6-in., and 9.66-mile, 4-in. gathering system, Frankston to Bullard, Texas.
Completion: August. 1961.

SINCLAIR PIPE LINE CO., Independence, Kans.
Project: 170-mile, 8-in. from LaVerne to Newalla, Okla.
Status: Underway.
Contractor: R. H. Fulton & Co.

TETON PIPE LINE CORP., 1700 Broadway, Denver 2, Colo.
Project: 45 miles, 6-in. in Dead Horse Creek, Barber Creek, and Sussex fields in Campbell and Johnson counties, Wyoming, to connect with Service Pipe Line Co. at Sussex.
Status: Approved by Wyoming PSC.

U. S. Products Pipelines

BUCKEYE PIPE LINE CO., 30 Broad St., New York 4.
Project: 42-mile 8-in. extension of Midwest products system from Flint to Bay City, Mich.
Completion: August 1961.

CARL M. LOEB, RHOADES & CO., 42 Wall St., New York 5.
Project: 75-mile, 20-in. from New Jersey refineries to Long Island airports, Idlewild and La Guardia.
Status: Proposed.

DIXIE PIPE LINE CO. 800 Enterprise Building, Tulsa.
Project: 1,100-mile, 8 to 10-in. propane line. Houston area to Raleigh, N. C.
Status: Service Pipe Line Co., Tulsa, design and construction agent.
Completion: Fall 1961.

EL PASO NATURAL GAS CO., El Paso, Tex.
Project: 58-mile, 6 in. LPG line Jal, N. M., plant to El Paso Natural Gas Products Co. refinery, Odessa, Tex.
Status: Planned.

GREAT LAKES PIPE LINE CO., Kansas City, Mo.
Project: Conversion of 6-in. products lines from Des Moines, Iowa, to Minneapolis and to Chicago area to tie-in with Northern Gas Products LPG line from Bushton, Kans.
Status: Planned.

HUMBLE PIPE LINE CO., Box 2220, Houston, Tex.
Project: 6.6-mile, 4-in. products line from Irving to Amon Carter field.
Status: Planned.
Completion: September, 1961.

INTERPROVINCIAL PIPE LINE CO., Toronto, Ont., Canada.
Project: 400-mile, 10-in. condensate line from Superior, Wis., to Chicago area via Interprovincial-Lakehead system.
Status: Proposed.

MID-AMERICA PIPELINE CO., 1437 S. Boulder, Tulsa.
Project: 106-mile, 6-in. extension from Whiting to Ogden, Iowa.
Status: Acquiring right-of-way.
Completion: Oct. 15, 1961.
Project: 100-mile extension from Ogden to Charles City, Iowa.
Status: Planned.
Construction: 1962.
Project: 405-mile, 10-in. condensate line from Superior, Wis., to Chicago.

NORTHERN GAS PRODUCTS CO., Omaha, Neb.
Project: 350-mile, 8-in. LPG line from Bushton, Kans., plant to Des Moines, Iowa, connecting with Great Lakes 6-in. lines to Twin Cities and to Chicago area.
Status: Planned.

SOUTHERN PACIFIC PIPE LINES, INC., 65 Market St., San Francisco, Calif.
Project: 70-mile 8-in. jet-fuel line from Stockton to Castle Air Force Base near Atwater, Calif.
Contractor: Eastern Pipeline Contractors, Dallas.

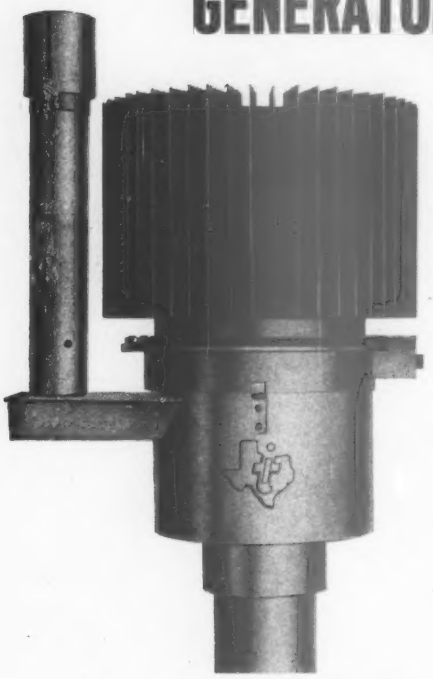
TEXAS EASTERN TRANSMISSION CORP., Box 1189, Houston 1, Tex.
★ Project: 6-mile, 8-in., Deer Park to Pasadena, Texas.
Status: Planned.
Project: 290-mile LPG line between South Louisiana and Mont Belvieu, Tex.
Status: Planned.

TRANS-SOUTHERN PIPELINE CORP., (subsidiary of Transcontinental Gas Pipe Line Corp., Box 296, Houston).
Project: 1,000 miles of 8 to 12-in. LPG line from Mont Belvieu, southeast of Houston, to Sanford, N. C.
Status: Three crossings completed.

WEST SHORE PIPE LINE CO., 1033 First Ave., Des Plaines, Ill.
Project: 285-mile, 10-16-in. line from East Chicago to Green Bay, Wis.
Status: Underway.
Completion: Mid-September 1961.
Contractors: Section One, 10 miles in Lake County, Indiana, Midwestern Contractors, Inc.; Section Two, 36 miles in Cook and Will counties, Illinois, and Section Three, 33 miles in Cook and Du Page counties, Illinois, Contracting and Materials Co.; Section Four, 63 miles in Cook and Lake counties, Illinois, and Kenosha, Racine and Milwaukee counties, Wisconsin, Houston Contracting Co.; Section Five, 43.5 miles in Milwaukee and Waukesha counties,

new from Texas Instruments

THERMOELECTRIC POWER GENERATOR



Unattended Power Source for

- Automatic Controls
- Telemetry Equipment
- Cathodic Protection
- Emergency Power

NO MOVING PARTS!

Texas Instruments Thermoelectric Generators provide an economical, maintenance-free power source for a variety of unattended, remotely located equipment. This completely new design uses no moving parts and can be operated on natural gas, propane, butane or other combustible fuel . . . provides power where commercial service has never been available.

The TI Thermoelectric Generator is built to withstand full exposure to the elements . . . no housing or special enclosure is required. Long-term reliability is assured by ruggedized construction and simplicity of basic design. Installation and operation are easily handled by regular field personnel.

Write for complete information.

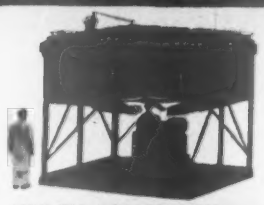
APPARATUS DIVISION
PLANTS IN HOUSTON AND DALLAS, TEXAS

TEXAS INSTRUMENTS
INCORPORATED
3609 BUFFALO SPEEDWAY
P. O. BOX 6027 HOUSTON 6, TEXAS

439

Young

BUILDS THE BEST HEAT TRANSFER PRODUCTS . . .
FOR THE CHEMICAL AND PETROLEUM INDUSTRIES



HC® AIR COOLED COOLERS AND CONDENSERS

In 14 basic sizes, either as single or multiple units, for handling large capacity cooling requirements for gases, oil and water, process fluids, and condensing steam and vapors. Catalog No. 557.

HEAT EXCHANGERS

Young offers a complete line of shell and tube fixed and removable type Heat Exchangers, for cooling jacket water, lube oil, gases and process fluids. All stainless steel construction available in fixed bundle arrangement. Many sizes from stock. Fixed tube bundle Catalog No. 1261. Removable tube bundle Catalog No. 1160.

EVAPORATIVE COOLERS AND CONDENSERS

Available in 8 models, with single, two or four coil assemblies. Engineered for cooling jacket water, lubricating oil, hydrocarbon gases, condensing steam or other vapors. Catalog No. 1959.

Write to Dept. F-391 for Catalog required

YOUNG RADIATOR COMPANY
RACINE, WISCONSIN
Plants at Racine, Wis. and Mattoon, Ill.

PIPELINE CONSTRUCTION

Wisconsin, and Section Seven, 29 miles in Brown County, Wisconsin, Sommerville Construction Co., and Section Six, 76 miles in Milwaukee, Washington, Sheboygan, Calumet and Manitowoc counties, Wisconsin, Panama-Williams Corp.

YELLOWSTONE PIPE LINE CO., Ponca City, Okla.
Project: 82-mile, 6-in. products line from Helena to Great Falls, Mont.
Completion: Dec. 1, 1961.
Contractor: R. H. Fulton & Co.

U. S. Natural Gas Pipelines

ALABAMA-TENNESSEE NATURAL GAS CO., Box 380, Florence, Ala.
Project: 3½-mile, 6-in. line to serve Armour Agricultural Chemical in Colbert County, Alabama.
Status: Planned.

ALAMO GAS SUPPLY CO., Alamo National Building, San Antonio, Tex.
Project: 166 miles of 20, 22, and 24-in. line and 101 miles of 12, 16, and 24-in. line from Texas Gulf Coast to San Antonio.

ALASKA PIPE LINE CO., Houston, Tex.
Project: 74 miles, Kenai to Anchorage.
Status: Construction resumed.
Project: Extension of Kenai-Anchorage line to Fairbanks.
Status: Feasibility studies ordered.

ALGONQUIN GAS TRANSMISSION CO., 25 Faneuil Hall Square, Boston 9, Mass.
Project: 30 miles of line in Massachusetts.
Status: Approved by FPC.

AMERICAN LOUISIANA PIPE LINE CO., Detroit, Mich.
Project: 25-mile, 8-in. to connect Holly Ridge field, Tensas Parish, Louisiana, to main line.
Status: Pending FPC approval.

ANADARKO PRODUCING CO. (Panhandle Eastern subsidiary), Box 1348, Kansas City 41, Mo.
★ Project: 83-mile, 10-12-in., from Spivey-Grabs-Basil field to Skelly Oil Refinery, El Dorado, Kans.
Status: Filed with Kansas Corporation Commission.

ARKANSAS WESTERN GAS CO., Box 405, Fayetteville, Ark.
Project: New lines from Altus, Coal Hill, and Rock Creek fields to the main system.
Status: Approved by Arkansas PSC.

BORDER GAS TRANSMISSION CORP. (Lehman Brothers, New York, and Rio Gas Gathering Co., 615 National Bank of Commerce Building, San Antonio 5, Tex.).
Project: Gathering lines in Starr, Zapata, Jim Hogg, Brooks, and Webb counties, Texas.
Status: Proposed.
Project: Gathering lines in Dimmit, Zavala and La Salle counties, Texas.
Status: Proposed.

CAROLINA PIPELINE CO., 4445 Devine St., Columbia, S. C.
★ Project: 67-mile, 8⅝-in., 20-mile, 10¾-in., Aiken to Camden, S. C.
Completion: Oct. 15, 1961.
Contractor: Panama-Williams Corp.

CITIES SERVICE GAS CO., Box 1995, Oklahoma City 1, Okla.
Project: 10½ miles of 8-in. to connect Rounds and Porter plant with main line in Marion County, Kansas.
Status: Planned.
Project: Gathering lines in Sterling field, Comanche County, Oklahoma.
Status: Pending FPC approval.

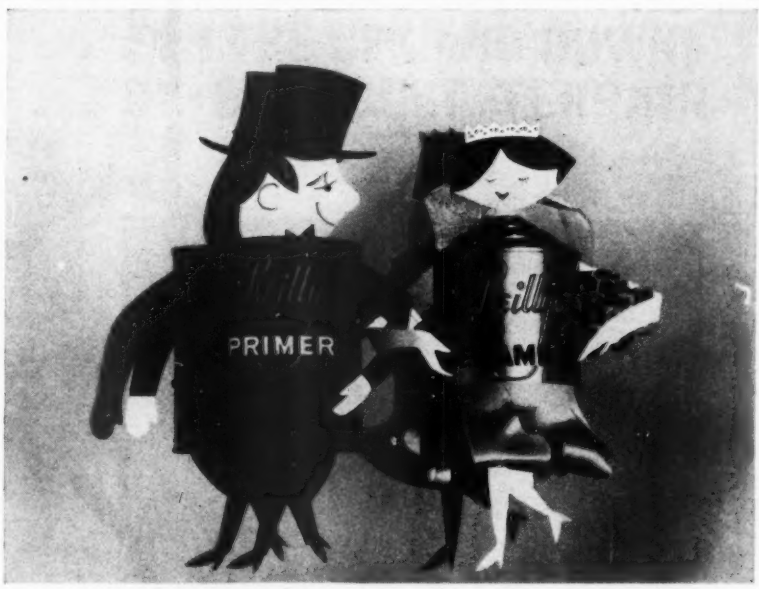
COASTAL TRANSMISSION CO., Houston, Tex.
Project: 71 miles laterals in Florida.
Status: Approved by FPC examiner.

COLORADO GAS TRANSMISSION CO., Colorado Springs, Colo.
Project: 250-mile, 20-inch line, from Ignacio-Blanco area, Southwest Colorado, to Walsenburg, Pueblo and Colorado Springs, Colo.
Status: Application before Colorado PUC.

COLORADO INTERSTATE GAS CO., Box 1087, Colorado Springs, Colo.
Project: 7 miles of 20-in. in Texas Panhandle.
Status: Pending FPC approval.
Completion: 1961.
Project: 109 miles of 26-in. from Texas Panhandle to southeastern Colorado; 134 miles of 34-in. from there to Pueblo, and 107 miles of 30-in. on to Denver.
Completion: 1961.
Project: 155 miles of 34-in. from Rock Springs, Wyo., to Provo, Utah, to connect with El Paso's proposed 395-mile line to California.
Status: Approved by FPC.
Completion: 1963.
Project: 32 miles of 6-in. from Central Colorado to Trinidad.
Status: Pending FPC approval.

COLORADO OIL & GAS CORP., Denver, Colo.
Project: 402-mile line from Gubik field to Fairbanks, Alaska.
Status: Proposed.

COLORADO-WYOMING GAS CO., Box 480, Denver 1, Colo.
★ Project: 4-mile, 3-in. lateral to Erie, Colo.



TOGETHER FOR GOOD

Reilly Coal Tar Enamels and related primers, used together, provide the corrosion protection needed by underground metal structures. The Reilly hot enamel system is:

electrically insulated	oxidationproof
waterproof	stressproof
oilproof	tough and strong
bacteriaproof	permanently bonded

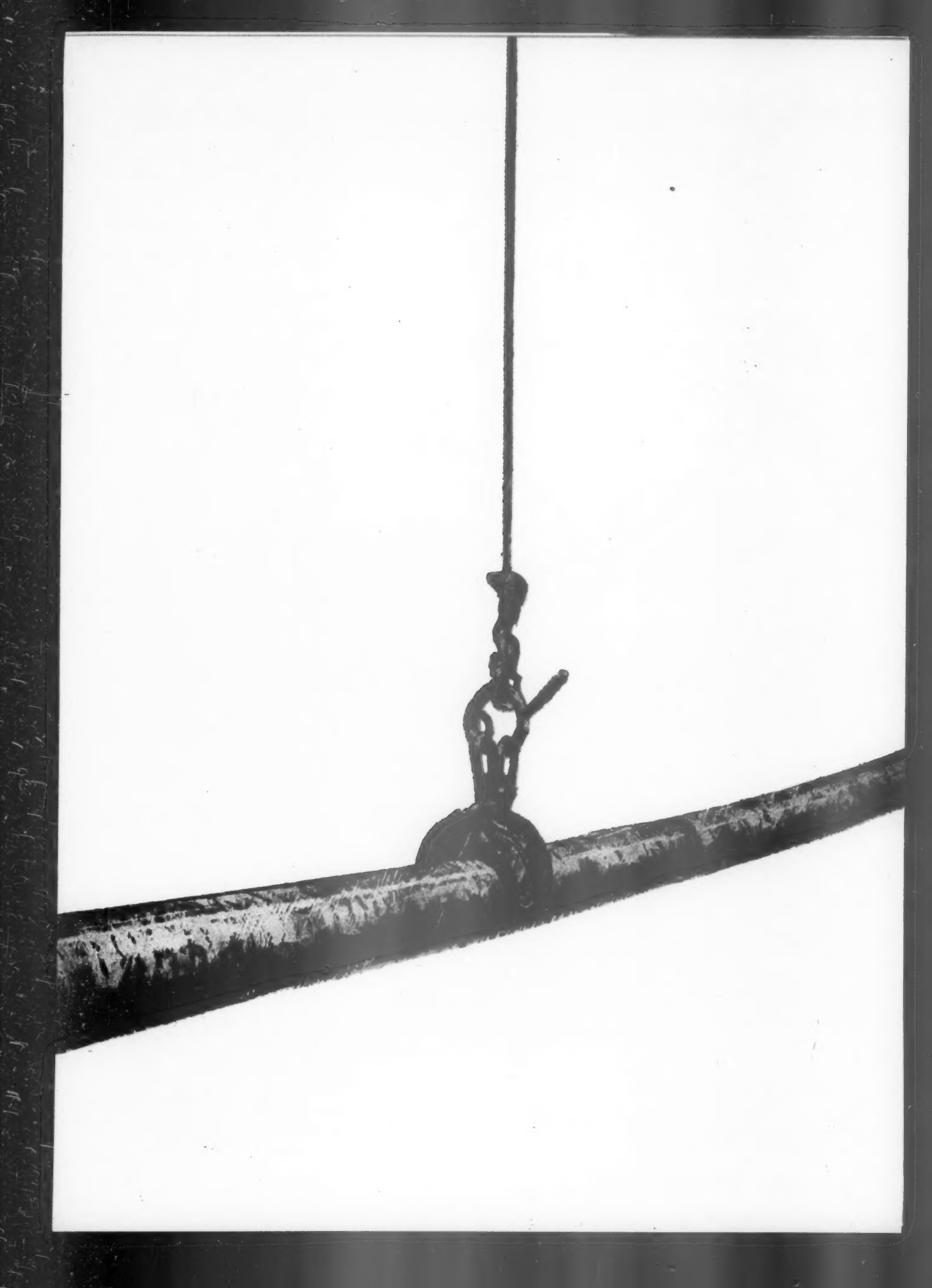
In addition, Reilly coating systems offer ultimate longevity because they inherit the chemical inertness and stability of coal tar, from which they are made.

Specify Reilly hot-applied coal tar enamels and related primers for oil, gas and water pipelines.

REILLY ENAMEL AND PRIMER

Reilly Pipeline Enamel Reilly Intermediate Enamel Reilly 230-A Enamel Reilly 230 AWWA Enamel	Reilly Pipeline Primer Reilly QD Primer Reilly 230 X-10 Primer Reilly 230 X-10 Primer	Reilly Redhead ® Primer
Reilly Hot Service Enamel	Reilly 230 X-10 Primer	

REILLY TAR & CHEMICAL CORP.
1615 MERCHANTS BANK BUILDING, INDIANAPOLIS 4, INDIANA



FOR THE UPS AND DOWNS OF DIFFICULT TERRAIN

J&L Electricweld Line Pipe. Mountainous country gives you a good indication of the quality of line pipe. It places a premium on the ability of pipe to bend to contour. And keeps you keenly aware of such factors as weldability and roundness.

Real line pipe quality begins with the steel itself. That's why J&L offers you such certainty. As a major steel producer, J&L controls line pipe quality from iron ore to finished product. Every length of J&L Line Pipe is produced on one of the most modern mills in the world. Welds are ultra-sonically tested and are sound from end to end. And you get pipe that is uniformly round and easy to weld on the job. J&L Line Pipe is available from 6⅝ inches through 12¾ inches.

Jones & Laughlin Steel Corporation

3 Gateway Center, Pittsburgh 30, Pennsylvania

J&L STEEL

PIPELINE CONSTRUCTION

Status: Pending FPC approval.
Project: 2-mile, 4-in. lateral to Niwot, Colo.
Status: Pending FPC approval.
Project: 16.7-mile, 16-in. from Arsenal Junction to Louisville, Colo.
Status: Pending FPC approval.

COLUMBIA GAS SYSTEM, INC., 120 East 41 St., New York 17.
Projects: Eight loops totaling 96.9 miles, 30-in. in Kentucky, Tennessee, Mississippi and Louisiana, plus 29 miles of 12-in. gathering line from near Houma, La., to the Texaco Dog Lake field.
Status: Planned.
Completion: 1961.

COLUMBIA GULF TRANSMISSION CO., Box 683, Houston 1, Tex.
Project: 9½ miles, 10-in. gathering line, Marguerite to Ivanhoe, La.
Status: Underway.
Project: 0.9 mile, 6-in. gathering line in Terrebonne Parish, Louisiana.
Status: Under way.
Project: 97 miles of main-line loop in Kentucky, Tennessee, Mississippi, and Louisiana, and 29 miles of 12-in. lateral supply lines in Louisiana.
Status: Pending FPC approval.
Completion: 1961.

COMMONWEALTH NATURAL GAS CORP., 116 South 3rd St., Richmond, Va.
Project: 8.97-mile, 16-in. line from Valve 19 to Valve 20 near Suffolk, Va.
Completion: September 1961.
Contractor: Latex Construction Co. of Georgia.

EAST TENNESSEE NATURAL GAS CO., Knoxville, Tenn.
Project: 10.1 miles, 4-in. lateral to South Carthage, Tenn., and 13.4 miles, 6-in. lateral to Pleasant Hill, Tenn.
Status: Planned.

EL PASO GAS SUPPLY CO. (subsidiary of El Paso Natural Gas Co., Box 1492, El Paso).
Project: 228-mile, 30-in. line, Live Oak County to Sonora, Sutton County.
Status: Pending FPC approval.

EL PASO NATURAL GAS CO., Box 1492, El Paso, Tex.
Project: 61.3-mile, 10¾-in. lateral to Bremerton, Wash., to be extended 75 miles to Port Angeles by Natural Gas Transmission Co., El Paso subsidiary.
Status: Before FPC.
Project: 52 miles of 20-in. to connect plant in Terrell County to a line in Pecos County, Texas, plus 23 miles of various-size field line.
Status: Approved by FPC.
Project: 119 miles of 30-in. Permian-San Juan crossover loop.
Status: Pending FPC approval.
Completion: 1961.
Project: 17 miles of 30-in. near Spokane, Wash.
Status: Pending FPC approval.
Project: 34 miles of 20-in. from Puckett tie-in to Goldsmith, Tex.
Status: Pending FPC approval.
Completion: 1961.
Project: 23 miles of 20-in. from Goldsmith to the Eunice-Plains line, and 395 miles of 34-in. from Thistle, Utah, to near Las Vegas, Nev.
Completion: 1961.
Project: Loop on the San Juan mainline, involving 27½ miles of 34-in.
Status: Pending FPC approval.
Project: About 228 miles of 30-in. from Coquat to Sonora, Tex.
Status: Pending FPC approval.

EQUITABLE GAS CO., 420 Boulevard of the Allies, Pittsburgh, Pa.
Project: 14.7 miles of 16-in. in Monongalia County, West Virginia, and Greene County, Pennsylvania.
Status: Approved by FPC.
Completion: July 1961.
Contractor: Joyce Pipeline Co.
Project: 5.7 miles of 20-in. in Greene County, Pennsylvania.
Status: Approved by FPC.
Completion: July 1961.
Project: 17 miles of 20-in. in Greene and Washington counties, Pennsylvania.
Status: Approved by FPC.
Completion: October 1962.

HOUSTON TEXAS GAS & OIL CORP., Box 10400, St. Petersburg 33, Fla.
Project: 235 miles of various size laterals in Florida.
Status: Approved by FPC examiner.

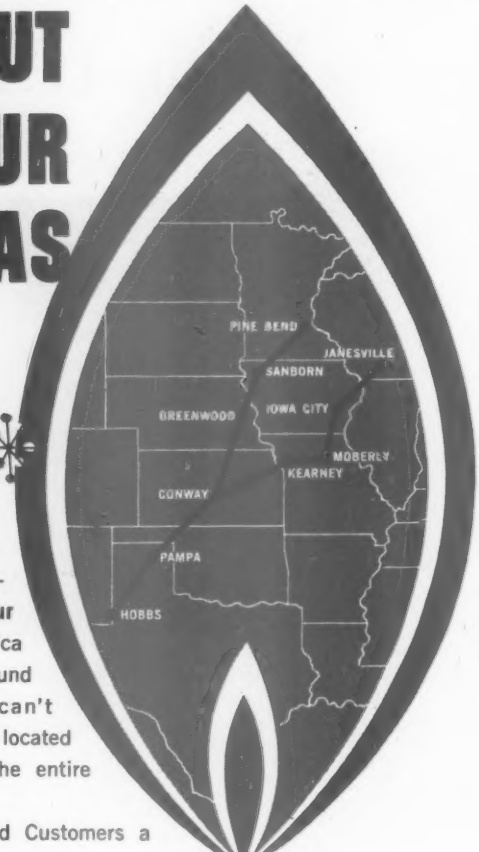
KANSAS-NEBRASKA NATURAL GAS CO., INC., Hastings, Neb.
★ Project: 13-mile, 2-in. and 4-mile, 1¼-in. from Almena to Long Island, Kans.
Completion: July 1, 1961.
Contractor: Roy E. Knupp.
Project: 6.3-mile, 8-in. gas line to serve coop fertilizer plant at Hastings, Neb.
Completion: Sept. 1, 1961.
Project: 24.5 miles, 8-in. gas line from Huntsman to Northport, Neb.
Completion: Oct. 1, 1961.

LO-VACA GATHERING CO. (see parent company, Coastal States Gas Producing Co.).

MANUFACTURERS LIGHT & HEAT CO., Union Trust Building, Pittsburgh 19, Pa.
Project: 10½ miles of 24-in. Washington and Beaver counties, Pennsylvania.
Status: Planned.
Completion: September 1961.

MICHIGAN WISCONSIN PIPE LINE CO., 500 Griswold St., Detroit, Mich.
Project: 64.5 miles, 4/10-in. Laverne field

PUT YOUR LP GAS ON THE MAP*



Avoid uncertain deliveries and artificial shortages. Arrange to have your LPG shipped via Mid-America Pipeline . . . the underground highway that weather can't block. Seven conveniently-located delivery terminals serve the entire upper midwest.

Do your Distributors and Customers a favor — put your products on the M.A.P.* call —

MID-AMERICA
PIPELINE COMPANY
1437 SOUTH BOULDER • TULSA, OKLAHOMA

PRECISION MEASUREMENT AT ANY FLOW RATE

AMERICAN-WESTCOTT A-88 ORIFICE METERS

Versatile American® Series A-88 mercury-type orifice meters meet the toughest flow measurement requirements – working pressures to 5,000 psi – interchangeable 10, 20, 50, 100 and 200-inch ranges. Recording meters may be equipped with 0-150° F. standard temperature element. Integrating meters integrate static and differential pressure, providing totalized flow indications. Telemetering equipped meters transmit integrated indications to remote locations.

- Manometer body easily cleaned – does not affect calibration.
- Tamper-proof calibration – simple, positive adjustment of float lever arm length.
- Interchangeable ranges – no manifold piping changes.
- Teflon-packed stuffing box is pressure tight, nearly frictionless, never needs lubrication.
- Teflon-packed pulsation dampener externally adjustable under full line pressure.
- Check valves give positive shut-off for over-range protection.

AMERICAN® METER COMPANY
INCORPORATED (ESTABLISHED 1836)
General Offices: Philadelphia 16, Pa.
Sales offices in principal cities

ONE DAY SERVICE
ONE SHIPMENT
ONE INVOICE

Orders Shipped Same Day Received

Combine your Couplings, Welding Fittings, Flanges, Swage Nipples and Bull Plugs, Pup Joints, Sub Nipples, Sub Couplings, Weld Reducers, Caps and Saddles on one purchase order and take advantage of prepaid freight or freight allowance. Freight prepaid on combined shipments of 500 lbs. or more of the above items to one destination.

For this kind of service and savings, send all your orders to
HENRY H. PARIS DISTRIBUTOR, INC.

DISTRIBUTOR FOR THE FOLLOWING PRODUCTS

ALTEN FOUNDRY & MACHINE WORKS
Lancaster, Ohio
Lubricated Plug Valves and Cocks.

DRESSER MANUFACTURING DIV.
Bradford, Pa
Seamless Welding Fittings, Couplings and Sleeves.

THE FAIRBANKS COMPANY
Binghamton, N. Y.
Bronze and Iron Valves.

THE GORMAN RUPP COMPANY
Mansfield, Ohio
Centrifugal Pumps.

HARRISBURG STEEL COMPANY
Harrisburg, Pennsylvania
Forged Steel Flanges and Seamless Casing Couplings.

LOS ANGELES BOILER WORKS, INC.
Los Angeles, Calif.
Welding Caps--Dished & Flanged Heads.

MILLS IRON WORKS, INC.
Los Angeles, Calif.
Seamless Swage Nipples, Bull Plugs & Welding Reducers.

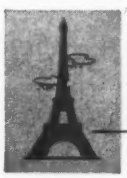
OIL STATES EQUIPMENT COMPANY
Houston, Texas
OSECO Silvertop Fusible Plugs with renewable inserts for all types OIL COUNTRY BOILERS.

STEEL FORGINGS, INC.
Shreveport, La.
Weld Saddles.

VOLCANO BURNER COMPANY
Houston, Texas
Volcano Superior and Gulf States All Steel Gas Burners for OIL COUNTRY BOILERS.

WESTERN SAFETY BARREL STAND
Houston, Texas
Stand lifts, holds, tilts 55 gal. barrels. Prevents spillage—easily loaded.

WHEELING MACHINE PRODUCTS CO.
Wheeling, West Virginia
XL Steel Pipe Couplings for OIL COUNTRY TUBULAR PRODUCTS



HENRY H. PARIS DISTRIBUTOR, Inc.

OIL WELL, REFINERY AND INDUSTRIAL SUPPLIES
1125 ROTHWELL ST. • P. O. BOX 932 • HOUSTON, TEXAS

YOUR ANSWER TO PORTABLE POWER

TOLEDO
"68"
POWER DRIVE

...It Weighs Only 33 lbs.

The handiest tool you can own for all around portable power in your shop, or on-the-job. It turns die-stocks up to 4", and works equally well with stand or geared dies. With optional adapters it replaces hand cranking, opens and closes large valves, operates hoists, winches and tapping machines. Its pony size has workhorse capacity, yet weighs only 33 lbs. Insist on TOLEDO for long-life service. Sold only thru your near-by Authorized TOLEDO Distributor.

Write for Catalog No. 300

TOLEDO

THE TOLEDO PIPE THREADING MACHINE CO. . . . TOLEDO 3, OHIO

handles all sizes of pipe—6 inches and up!

C-R-C
IMCO BEVELER

One C-R-C IMCO Pipe Beveler and cutting torch with a complete set of bands handles all sizes of pipe from 6 through 60 inches standard • Makes perfect, complete square cuts • cuts out-of-round pipe without additional attachments • flexible drive shaft permits safe operation • fast set-up—simple operation—easy to store or transport.

SERVING PIPELINERS SINCE 1933

For complete information write or call

CRC CRUTCHER-ROLFS-CUMMINGS, INC.

Home Office: Houston, Texas, Box 2073, OVerland 6-4301.
Export Office: D. T. O'Conner, Inc., 500 Fifth Avenue, New York 36, N. Y., BRyant 9-2236
In Canada: Canadian Equipment Sales & Service Co., Ltd., 7310 99th St., Edmonton, Alberta, Canada

New Edition Ready—

DIRECTORY

OF PLANTS AND PERSONNEL

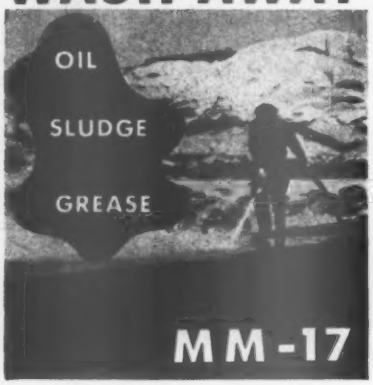
The 1961-62 edition lists men in U. S., Canadian, Western European, and Middle Eastern refineries and petrochemical plants. Also a complete listing of U. S. and Canadian gas processing plants. Gives more than 8,500 key personnel.

- Alphabetical listing of U. S., Canadian, Western European and Middle Eastern refineries—U. S. and Canadian gas processing plants.
- Geographical survey of active refineries around the world with capacities and processes.
- Summary of U. S., Canadian, and Western European petrochemical plants—Locations—Raw Materials—Key Personnel.

Order your copy today **$25.00**

READER SERVICE DEPARTMENT
THE OIL AND GAS JOURNAL
Box 1260 **Tulsa, Oklahoma**

WASH AWAY



Sea wall at Scituate, Mass., where heavy deposit of bunker oil from sunken tanker was completely removed by spraying MM-17 on oil and hosing off with water.

- **Quickly and safely emulsifies oil spills**
- **Flushes clean with fresh or salt water**
- **Non-explosive, no toxic vapors, does not burn skin**

MM-17 overcomes emergencies caused by oil spills on land or water. It is the safest and most efficient emulsifier extensively used for this purpose.

MM-17 cuts through deep layers of heavy oil and sludge where ordinary solvents fail. Here is a scientific cleaner for oil tanks, pipe lines, piers, loading platforms and oil handling equipment.

MM-17 is sprayed or brushed on the surface to be cleaned. In minutes, oil and grease can be hosed off or wiped away.

Get ready now for annual clean-up and emergencies. Order MM-17 today and have it on hand when you need it.

Single drums (55 gal.) . . . . . $2.42/gal.
Six drums on same order . . . . $2.18/gal.
Bulk shipment prices on request.

FREE Barrel Drain Truck with first order. Listing for $31.50, this truck is yours free with your first drum of MM-17.

PIPELINE CONSTRUCTION

gathering lines.
Status: Planned.
Completion: Gradually over 1961.
Project: 97 miles, 16/20-in. gas line from Woodward, Okla., area to Greensburg, Kans., compressor station.
Status: Before FPC.
Project: 68 miles, 4/10-in. gathering system, Woodward, Okla., area.
Status: Before FPC.
Project: 26 miles, 30-in. loop in Michigan, 10 miles, 12-in. loop in Wisconsin.
Status: Pending FPC approval.
Project: 48 miles, 10-in. Madison lateral to Baraboo, Wis.
Status: Pending FPC approval.

MISSISSIPPI RIVER FUEL CORP., 407 North 8th Street, St. Louis 1, Mo.
Project: 5 miles of 16-in. and 15 miles of 12-in. from Collinsville, Ill., to St. Jacob, Ill.
Status: Pending FPC approval.

MONTANA-DAKOTA UTILITIES CO., Minneapolis, Minn.
★ Project: 106-mile, 12-in.; 22-mile, 3-in.; 20-mile, 2-in., Minot to Bismarck, N. D.
Status: Pending FPC approval.
Completion: Sept. 1, 1961.
★ Project: 12-mile, 6-in.; 17-mile, 4-in.; 2-mile, 2-in., Alexander to Watford City, N. D.
Status: Pending FPC approval.
Completion: Sept. 1, 1961.
★ Project: 14-mile, 8-in., McGregor to Tioga, N. D.
Status: Pending FPC approval.
Completion: Sept. 1, 1961.
★ Project: 3-mile, 3-in., lateral to Fryburg, N. D.
Status: Pending FPC approval.
Completion: Sept. 1, 1961.
★ Project: 2-mile, 4-in. lateral to Holly Sugar Corp., Hardin, Mont.
Status: Pending FPC approval.
Completion: Sept. 1, 1961.

MONTANA POWER CO., Box 1338, Butte, Mont.
Project: 16-in. line from Carway, Alta., to Cut Bank, Mont.
Completion: 1961.

MOUNTAIN FUEL SUPPLY CO., Salt Lake City, Utah.
Project: 94.3-mile, 20-in. gas line with Natural Gas Co. from Uinta basin to near Provo, Utah.
Status: Approved by Utah PSC.

MUSTANG FUEL CORP., Box 3966, Oklahoma City, Okla.
★ Project: 36-mile, 8¾-in. and 4½-in., from Henryetta to Lamar, Okla.
Completion: July 1961.

NATURAL GAS PIPELINE CO. OF AMERICA, 122 South Michigan Avenue, Chicago.
Project: 50 miles of 20-in. laterals and 4.5 miles of 6-in. laterals to connect with existing 26-in. system in Jim Wells County, Texas, plus 33 miles of 10-in. laterals in the Normanna area.
Status: Temporary FPC approval.
Project: 285 miles, 30-in. and 60 miles, 36-in. loops and 22.5 miles, 8-in. laterals between Texas and Illinois.
Status: Pending FPC approval.
Completion: 1961.

NORTHERN NATURAL GAS CO., 2223 Dodge St., Omaha 1, Neb.
Project: 65-mile, 16-in. line from Duluth to Reserve Mining, Minn.
Contractor: Curran & Co.
Completion: Aug. 1, 1961.
Project: 11.5 miles, 30-in.; 62.7 miles, 16-in. and 1.2 miles, 4-in. to serve towns of Silver Bay and Two Harbors, Mich.,

Strahman

HIGH PRESSURE GAUGES

FOR CHEMICAL PLANTS AND REFINERIES

THRU VISION

REFLEX
Single or Multiple Sections

Multiple section gauges are made with a one piece body chamber. This method of construction, originated by Strahman, has become generally adopted as standard by most gauge manufacturers.

An added safety feature! Except for visibility slot, glass is completely enclosed.

- Explosion proof Illuminators
- Heated or cooled gauges
- Large Chamber Gauges
- Frost-proof extensions
- Tubular Gauges
- Gauge Cocks

STRAHMAN VALVES INC.
NICOLET AVE., FLORHAM PARK, N. J.

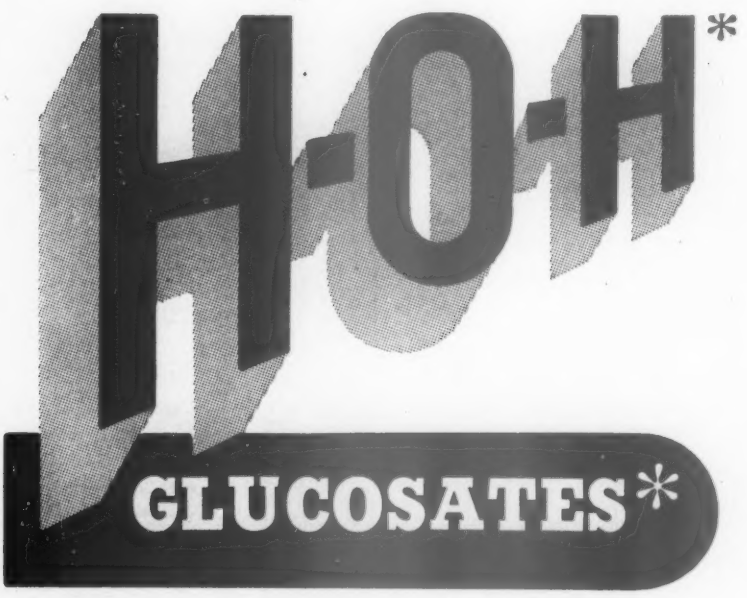
PIPELINE CONSTRUCTION

and Reserve Mining Co., Silver Bay.
Status: Conditionally approved by FPC.
Projects: 1,100 miles of laterals:
116 miles, 2-8 in. to 20 Minnesota towns.
Contractor: Davis Construction Co.
136 miles, 2-8 in. to 26 Minnesota towns.
Contractor: Harbert Construction Co.
426 miles, 2-19 in. to 62 Iowa towns.
Contractor: R. H. Fulton & Co.
130 miles, 2-8 in. to 25 Iowa and Nebraska towns.
Contractor: Shamrock Construction Co.
176 miles, 2-8 in. to 29 Iowa, Nebraska, South Dakota towns.
Contractor: Brodie Construction Co.
116 miles, 2-8 in. to 15 Minnesota, South Dakota towns.
Contractor: R. E. Reutzel Co.
Status: Underway.

Completion: September 1, 1961.

OHIO FUEL GAS CO., Columbus, Ohio.
Project: 24.5-mile replacement program, 2.4-mile, 18-in. Meigs, Athens, Hocking counties; 4.5-mile, 12-in., Perry, Muskingum counties; 0.8-mile, 16-in., 2.7-mile, 18-in., Montgomery, Greene, Madison counties; 8.4-mile, 12-in., Stark, Wayne, Carroll, Columbiana counties; 5.7-mile, 20-in., Medina, Lorain counties.
Status: Underway.
Completion: 1961.
Contractor: Central Pipeline Co., Ohio Pipe Line Construction Co., H. L. Gentry Construction Co.

OKLAHOMA-ILLINOIS GAS PIPELINE CO., M. & M. Bldg., Houston 1, Texas. (Joint Fish Engineering Corp. and Pan American Petroleum Corp. venture.)
Project: 550-mile, large diameter line from Woodward, Okla., to St. Louis, Mo.



● STILL THE BEST
For Controlling
Scale And Corrosion
In Industrial Waters.

*REGISTERED U.S. PAT. OFFICE

D.W. HAERING & CO., INC.
ANALYSTS · CONSULTANTS · MANUFACTURERS
P.O. Box 10337 San Antonio 21, Texas

Status: Proposed.

PACIFIC GAS & ELECTRIC CO., 245 Market St., San Francisco, Calif.
Project: 67 miles of line from Kettleman Hills to Morro Bay, Calif.
Project: 120 miles of 34-in. looping of Topock-Milpitas main line.
Status: Planned. Pending FPC approval.
Completion: 1963.
Project: 291 miles of 36-in. from the California-Oregon border to Antioch, Calif. (Part of a 1,400-mile project to move Alberta gas to San Francisco.)
Contractor: H. C. Price Co., Bartlesville, Okla. (Bechtel Corp. San Francisco, is the engineering manager.)
Status: Under way.
Completion: Dec., 1961.

PACIFIC GAS TRANSMISSION CO., (Pacific Gas & Electric Co., San Francisco).
Project: 611 miles of 36-in. from the Canadian border at Eastport, Idaho, to the California border near Klammath Falls, Ore. (Part of a 1,400-mile project to move Alberta gas to San Francisco.)
Contractors: Western Pipe Line, Inc., Austin, Tex., and J. P. Neill & Co., Dallas, have contracts for the 465-mile southern portion. H. C. Price Co., Bartlesville, Okla., has contract for the 146-mile northern portion from Rosalia, Wash., to Eastport, Idaho. (Bechtel Corp., San Francisco, is the engineering manager.)
Status: Under way.
Completion: Dec., 1961.

PACIFIC LIGHTING GAS SUPPLY CO., Los Angeles, Calif.
Project: 24-mile, 16-in. gas line from Gaviota to Goleta, Calif.
Completion: August 1961.

PANHANDLE EASTERN PIPE LINE CO., 120 Broadway, New York.
Project: Gathering lines, 3.85 miles of 4-in. and 3.44 miles of 6-in. in Oklahoma and 1.87 miles of 4-in. and 1.01 miles of 6-in. in Kansas.
Project: 298 miles of 30-in. loops, 43 miles of 16 to 26-in. supply laterals, and 80 miles of 6 to 12-in. sales laterals.
Status: Pending FPC approval.

PEOPLES NATURAL GAS CO., Pittsburgh, Pa.
Project: 15.25 miles, 8 to 20-in., Allegheny and Westmoreland counties, Pennsylvania.
Status: Planned.
Completion: June-August 1961.

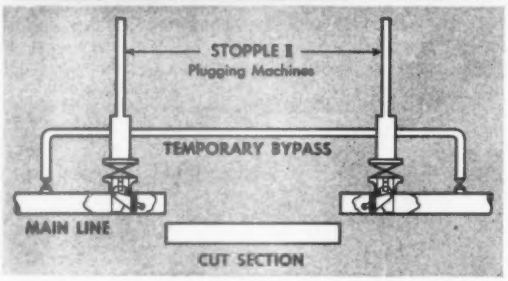
PHILLIPS PETROLEUM CO., Bartlesville, Okla.
Project: 16 miles of 2 to 8-in. gathering line in Eddy County, New Mexico.
Status: Planned.
Project: 17 miles of 4 to 10-in. gathering line in Midland County, Texas.
Status: Planned.

PIONEER NATURAL GAS CO., Amarillo, Tex.
Project: 21 miles of 12-in. from Sudan to Muleshoe, Tex.
Status: Pending FPC approval.
Project: 12 miles of 10-in. from Muleshoe, Tex., northward.
Status: Pending FPC approval.

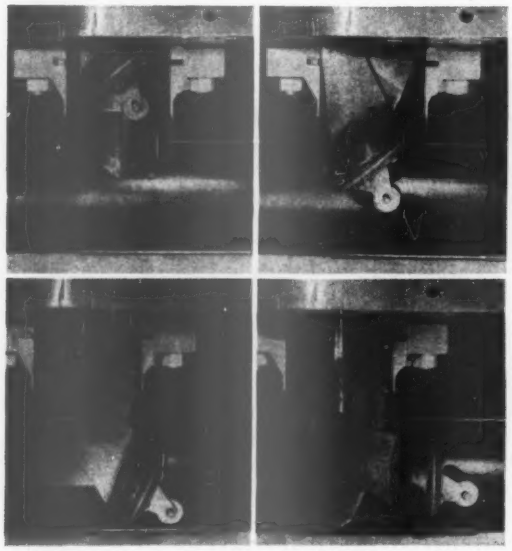
PIPELINE TECHNOLOGISTS, INC., Houston, Tex.
Project: 50 miles various size lines, gas gathering system, Marion County, Kansas.
Completion: September 1961.

SOUTH GEORGIA NATURAL GAS CO., Box 791, Thomasville, Ga.
★ Project: 2½-mile, 3½-in. from main line to Slyvester, Ga.
Completion: November 1961.
★ Project: 2½-mile, 3½-in. from main line to Ocilla, Ga.
Completion: November 1961.

SOUTHERN CALIFORNIA GAS CO., and



❶ "This method of plugging a line and bypassing the flow has been used extensively in plant and field operations with WMSon tapping and STOPPLE equipment. Many costly shutdowns have been avoided. Now, WMSon engineers have re-designed and improved the STOPPLE Plugging Machine. Result . . . the all new STOPPLE II . . . offering hydraulic operation, improved, simplified construction, and economy—real economy!"



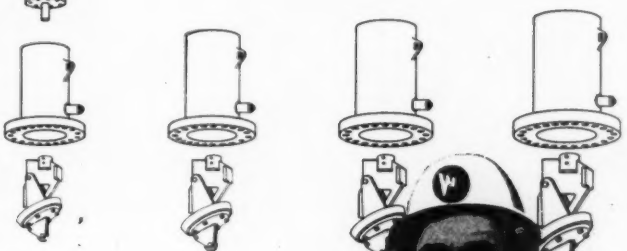
❸ "Here's how STOPPLE II works. After the tap is made, the STOPPLE II is mounted on a WMSon SANDWICH Tapping Valve, and the plugging head is lowered into the line, stopping the flow completely. New single link construction of the plugging head offers built-in simplicity . . . and strength for high pressure plugging."

NEWS FROM DOWN THE LINE!

NEW economy
NEW improved design
NEW interchangeable plugging heads . . .

WMSON'S ALL NEW STOPPLE® II

Plugging Machine for piping modification or repair WITHOUT SHUTDOWN!



❷ "Here's the major reason for this economy. The STOPPLE II has a hydraulic cylinder that is interchangeable with plugging heads of different sizes. For example, one hydraulic cylinder can be used on a 14", 16", 18" or 20" line by using it in combination with a plugging head and housing of the proper size."

•

WMSon STOPPLE II with hydraulic operation is available in sizes 8"–30". The 4" and 6" units are hand operated. Single link is standard in all sizes. Write for additional information and specifications:

U.S. AND FOREIGN PATENTS AND PATENTS PENDING

T.D. Williamson, Inc.

P. O. BOX 40 • TULSA 2, OKLAHOMA

REPRESENTATIVES AROUND THE WORLD

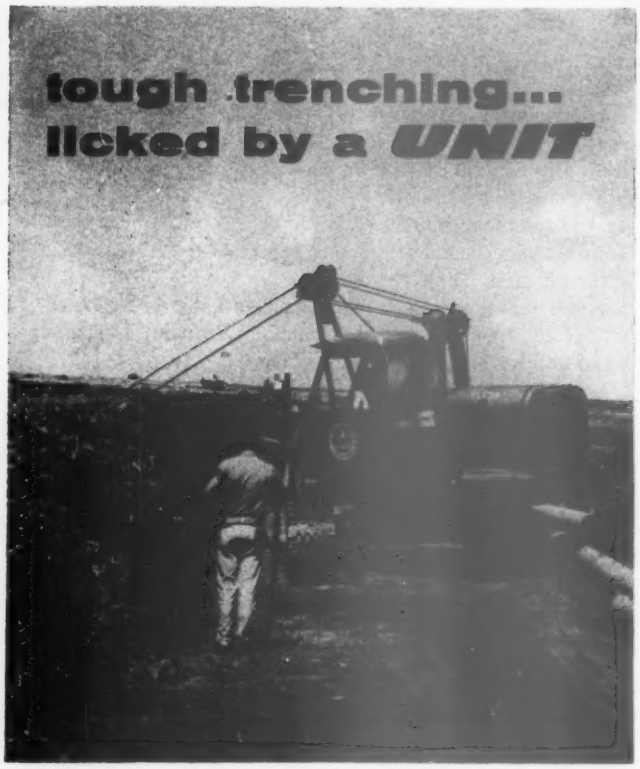
"... growth through leadership"

An established leader in pipelining . . .
Majestic has the men, the methods
and the machines for your job.

The Majestic record has been one of sound
growth through leadership of experienced
executives at the planning level
and skilled workmen in the field.

Pipelines are built better Majestically . . .

Majestic
contractors Inc.
1902 TENNESSEE BUILDING, HOUSTON



tough trenching...
licked by a UNIT

In constructing a 12-in. line for the Oklahoma Natural Gas Co., Pipeline Service Company, Lindsay, Oklahoma, had tough going. There's no doubt about it; look at that rocky spoil! This is digging that only the best in trenchoes could tackle. Handling it . . . a UNIT ¾-yd. Model 1020A.

UNIT trenchoes are built for rugged digging. UNIT's unique direct-in-line power transmission design pays big dividends in output. Power is transmitted through a worm-driven power take-off with "one step" speed reduction. There's little power loss through friction. You get steady dipper pull.

UNIT trenchoes keep going, too, without excessive downtime. Track and turntable rollers, gears, and shafts are forged for uniform toughness. Shafts are involute splined for greatest strength. All gears, shafts, and bearings are enclosed in a constant oil bath.

UNIT trenchoes are available in ½- to 1-yd. sizes . . . are fully convertible to dragline, crane or clam — on crawler or rubber. See your UNIT distributor for complete information on the size that fits your needs.

UNIT
UNIT CRANE & SHOVEL CORP.
6327 W. Burnham St.,
Milwaukee 19, Wisconsin

PIPELINE CONSTRUCTION

SOUTHERN COUNTIES GAS CO. OF CALIFORNIA, Los Angeles, Calif.
Project: 92.9-mile, 34-in., Ivanpah to Newberry, Calif.
Status: Approved by California PUC.
Completion: Jan. 1, 1964.

SOUTHERN NATURAL GAS CO., Birmingham, Ala.
Project: 14.4 miles, 20-in. gas line from Gwinville field to Pickens station.
Status: Pending FPC approval.
Completion: Dec. 31, 1961.

SOUTHERN UNION GAS CO., Fidelity Union Tower, Dallas 1, and **EL PASO NATURAL GAS CO.,** Box 1492, El Paso, Tex.
Project: 60-mile line from El Paso's main line near Holbrook, Ariz., to paper mill under construction near Snowflake.
Status: Planned.

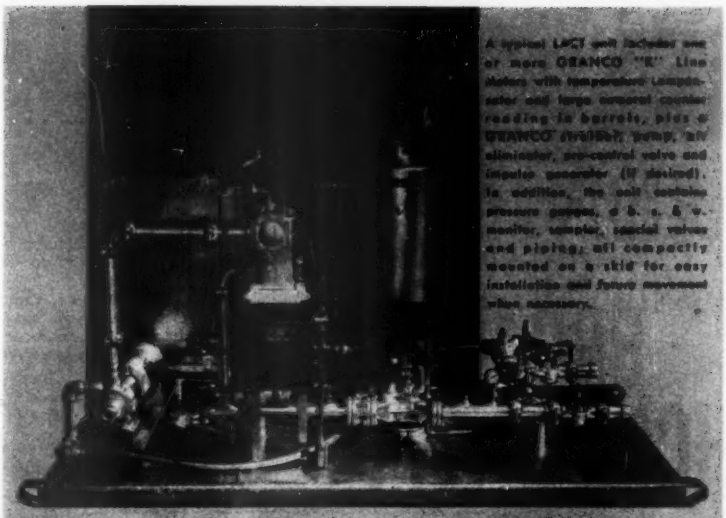
SOUTHERN UNION GAS CO., Dallas, Tex.
Project: 22.6 mile, 8⅝-in. line connecting transmission line near Holbrook, Ariz., to point 15 miles west of Snowflake.
Completion: Aug. 1961.
Project: 7.2 mile, 16-in. line from Santa Junction to Alameda, N. M.
Completion: Aug. 1961.
Contractor: Mermis Construction Co.
Project: 5 mile, 8⅝-in. line from Southwestern Public Service Cunningham station to Lovington, N. M.
Completion: July 1961.

ST. LAWRENCE GAS CO., Ogdensburg, N. Y.
Project: 75 miles of line from Cornwall, Ont., to Ogdensburg, N. Y.
Status: Approved by FPC.

TENNESSEE-CALIFORNIA GAS TRANSMISSION CO., Box 2511, Houston, Tex.
Project: 105-mile, 26-in. line from Humble's King Ranch via Kleberg, Brooks and Hidalgo counties to Mexican border to connect with Tennessee-Pemex line to California. Included are 69 miles of 12-in. and smaller laterals.
Status: Pending FPC decision.

TENNESSEE GAS PIPELINE CO., a division of Tennessee Gas Transmission Co., Box 2511, Houston 1, Tex.
★ Project: 8.1-mile, 16-in. gathering line, offshore Louisiana.
Status: Approved by FPC.
★ Project: 6-mile, 12-in. gathering line, offshore Louisiana.
Status: Approved by FPC.
Project: 18.5 miles, 12-in. gathering lines, offshore Louisiana.
Status: Approved by FPC.
Project: 12.6 miles, 12-in. gathering lines offshore Louisiana.
Status: Approved by FPC.
Project: 9.8 miles, 10-in. gathering lines, offshore Louisiana.
Status: Pending FPC approval.
Project: 20.6 miles, 12-in. gathering lines, offshore Louisiana.
Status: Pending FPC approval.
Project: 13 miles, 20-in. gathering lines, offshore Louisiana.
Status: Approved by FPC.
Project: 7.4 miles, 12-in. gathering lines, offshore Louisiana.
Status: Approved by FPC.
Project: 158 miles of 36-in. loop lines at various points between Kinder, La., and Centerville, Tenn.
Status: Approved by FPC.
Project: 166 miles of 36 and 30-in. loop lines at various points in Ohio and Pennsylvania.
Status: Pending FPC approval.

TENNESSEE GAS TRANSMISSION CO., Box 2511, Houston, Tex.
Project: 1,100-mile, 30-in. line Texas to



A typical LACT unit includes one or more GRANCO "R" Line Meters with temperature compensator and large numeral counter reading in barrels, plus a GRANCO sweetheart pump, air eliminator, pre-control valve and impulse generator (if desired). In addition, the unit contains pressure gauges, a. b. a. & v. monitor, sampler, special valves and piping; all compactly mounted on a skid for easy installation and future movement when necessary.

GRANCO

LACT *UNITS*

"on stream"

pay off in accuracy . . . dependable, trouble-free performance

LACT producers use volume measurement as the basis for dollar evaluation of crude-oil custody transfer. More and more, producers large and small are specifying GRANCO positive displacement metering systems. These modern, 5-blade, rotary type positive displacement meters provide smooth, non-pulsating operation with unparalled accuracy over the complete flow range. Ruggedly constructed and specially designed for LACT operations, they require little or no maintenance.

In the Texas panhandle and Midland-Odessa area, GRANCO equipped LACT units are installed on most major pipelines. Here, for measuring sour crude, GRANCO meters are supplied with iron internals and treated with a protective coating to assure trouble-free performance.

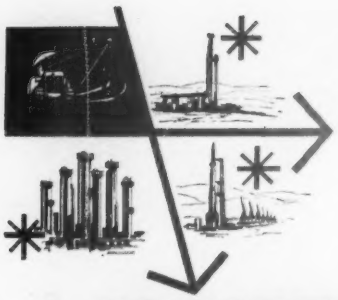
For complete details on GRANCO equipment and skid mounted LACT units, consult your local GRANCO distributor.

GRANCO

GRANBERG CORPORATION

1308 67th Street, Oakland 8, California

Sales and Service Representatives throughout the nation.



BROADER HORIZONS...

The work of Burden in the North American Pipe Line System Construction field is well known. With the broadening of the world petroleum and gas industry Burden has been actively engaged in work abroad and is now in position to contract for work anywhere.

O. R. BURDEN CONSTRUCTION CORP.

PIPELINE CONSTRUCTION AND RECONDITIONING

DRILLING / REFINERY, CHEMICAL PLANT AND MISSILE BASE CONSTRUCTION THROUGH WHOLLY-OWNED OR AFFILIATED COMPANIES.

P. O. BOX 5216/TEmple 8-3378/TULSA, OKLAHOMA

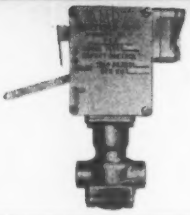
CABLE ORB

Amot Model 1476 Safety Control

Acts immediately to STOP ENGINE

When oil or control pressure drops below set level, Amot Model 1476 automatically trips and shuts down engine using positive snap action principle. Tripping pressure adjustable from 5 to 30 p.s.i. For solid fuel or gas engines. Used with other safety devices for complete protection.

Compact, non-electrical.



Amot controls CORPORATION

THERMOSTATS CONTROLS SWITCHES VALVES SAFETY CONTROLS

407A FIRST ST. • RICHMOND, CAL., U.S.A.

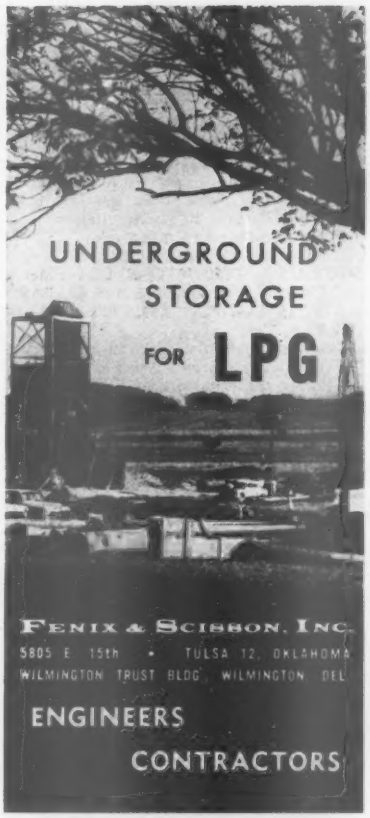
PIPELINE CONSTRUCTION

California via Mexico (see Foreign).
Project: 292-mile line from the California-Mexican border to Los Angeles to tie in with above-mentioned line.
Status: Tennessee Gas' subsidiary, California Gas Transmission Co., and Southern California Edison Co. have applied to California PUC. Also pending FPC approval.
Project: A line from King Ranch, Texas, to the Mexican border, to connect with proposed line through Mexico to California.
Status: Tennessee Gas subsidiary, Tennessee California Gas Transmission Co., to build and operate the Texas segment.

TEXAS EASTERN TRANSMISSION CORP., Box 1189, Houston 1, Tex.
Projects: 165 miles of 20-in. from West Monroe, La., to Kosciusko, Miss.
Status: Planned, filed with FPC.
Completion: 1961.
Project: 40 miles, 36-in., Station 26 to Station 27, N. J.
Status: Planned, authorized.
Contractors: H. C. Price Co., Napp-Grecco Co.
Completion: 1961.
Project: 89 miles, 30-in. Kosciusko station, Miss., and Station 21-A, Pa.
Status: Planned, filed with FPC.
Completion: 1961.
Project: 40 miles, 30-in. Delmont station, Pa., to Station 26, N. J.
Status: Planned, filed with FPC.
Completion: 1961.
Project: 45 miles, 30-in. Delmont station, Pa., to Station 26, N. J.
Status: Planned, filed with FPC.
Completion: 1962.
Project: 42 miles, 30-in., Kosciusko station, Miss., to Station 21-A, Pa.
Status: Planned, filed with FPC.
Completion: 1962.
Project: 57 miles, 14-in., Castor, La., to West Monroe, La.
Status: Planned, filed with FPC.
Completion: 1961.
Project: 13 miles, 14-in. Middlesex County, to Barnardsville, N. J.
Status: Planned, filed with FPC.
Completion: 1962.
Project: 14 miles, 12 in., Barnardsville to Roseland, N. J.
Status: Planned, filed with FPC.
Completion: 1961.
Project: 11 miles, 10 in., Middlesex County to Helvetta, N. J.
Status: Planned, filed with FPC.
Completion: 1961.

TEXAS GAS TRANSMISSION CORP., Box 577, Owensboro, Ky.
Projects: 146 miles of new line including 6, 26, and 30-in. loops in Kentucky, Tennessee, Mississippi, Louisiana, and Indiana, and 50 miles of 8 and 16-in. to connect five fields in Terrebonne Parish, Louisiana.

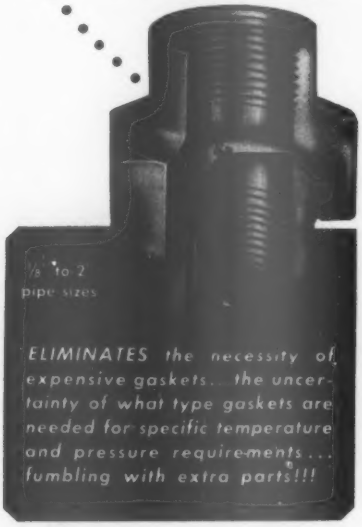
TRANSCONTINENTAL GAS PIPE LINE CORP., 3100 Travis St., Houston, Tex.
Project: 25-mile, 30-in. main line loop, Texas.
Completion: 1961.
Project: 18-mile, 36-in. main line loop, Louisiana.
Completion: 1961.
Project: 35-mile, 36-in. main line loop Mississippi.
Completion: 1961.
Project: 32-mile, 36-in. main line loop, Alabama.
Completion: 1961.
Project: 59-mile, 36-in. main line loop, Georgia.
Completion: 1961.
Project: 36-mile, 36-in. main line loop,



here's real **ECONOMY...**
time-saving **SIMPLICITY...**
and sure-fire **DEPENDABILITY**

for metering, measuring, controlling any piped material!

this Catawissa Cup-Orifice Plate CONVERTS any standard Catawissa Union into a ***GASKETLESS*** **ORIFICE UNION**

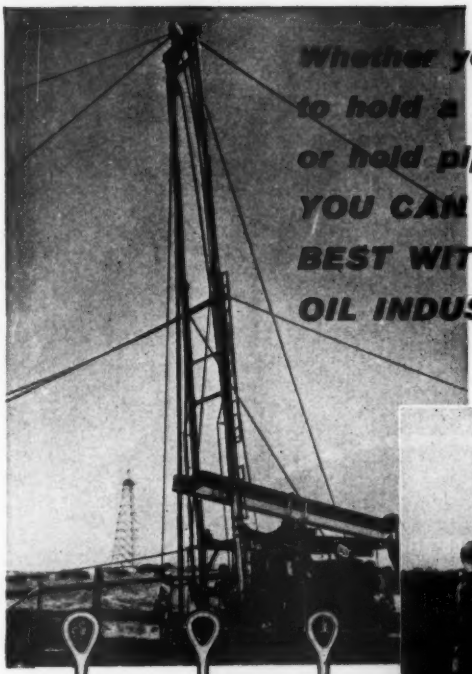


ELIMINATES the necessity of expensive gaskets... the uncertainty of what type gaskets are needed for specific temperature and pressure requirements... fumbling with extra parts!!!

Orifice Union problems of the past are gone forever! Stainless or carbon steel cup-orifice plate fits easily, quickly, securely to form a good, tight, leakproof seal. Temperature and pressure requirements are restricted only by the rating of the union itself (3000-lb. service, 9000-lb. test)!

Just specify "Catawissa Cup-Orifice Plates" or "Catawissa Cup-Orifice Unions" at your favorite supply store—or write for catalog and complete information.

CATAWISSA VALVE & FITTINGS CO.
CATAWISSA · PENNSYLVANIA



Whether you need to hold a rig up or hold pipe down... YOU CAN HOLD IT BEST WITH CHANCE OIL INDUSTRY ANCHORS

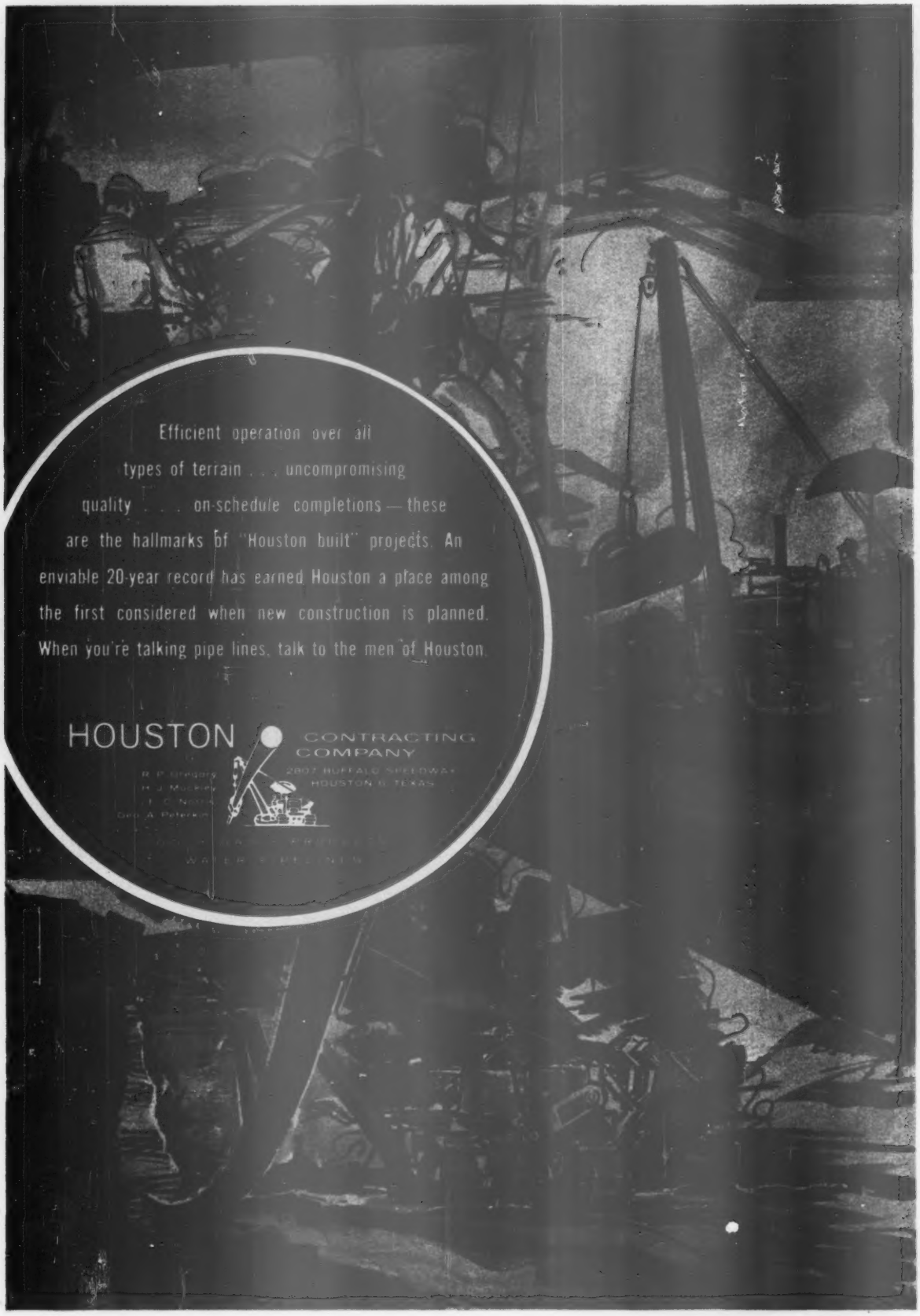
GUY YOUR DRILLING OR SERVICING EQUIPMENT with Chance Screw Anchors, Chance Expanding Anchors, or Chance Plate Anchors. Depending on soil conditions, and the load to be held, and whether the installation is to be temporary or permanent, one of the three is just right for any application.

SOLVE PIPELINE FLOTATION PROBLEMS with Chance Pipeline Screw Anchors and Tie-Down Brackets... the surest, easiest, and most reliable way to anchor pipelines. Your costs will drop about 85% compared to counter-weighting, and you can have the whole project engineered, supervised, and tested by Chance technicians under the Chance Field Service Plan. This cuts time and labor costs... makes certain the anchoring is adequate for every foot of pipeline. We'll also supply special installation equipment and the services of an installation supervisor for a reasonable fee.

CO61-9

For complete information, contact: Petroleum Equipment Engineering and Service Division of

A. B. CHANCE COMPANY
1311 Polk Ave., Houston 2, Texas, Phone CApitol 8-2777
INTERNATIONAL DIVISION CENTRALIA, MO., U. S. A.


Efficient operation over all types of terrain . . . uncompromising quality . . . on-schedule completions — these are the hallmarks of "Houston built" projects. An enviable 20-year record has earned Houston a place among the first considered when new construction is planned. When you're talking pipe lines, talk to the men of Houston.
HOUSTON
CONTRACTING COMPANY

PIPELINE CONSTRUCTION

South Carolina.
Completion: 1961.
Project: 7-mile, 16-in. main line loop, New Jersey.
Completion: 1961.
Project: 19-mile, 36-in. main line loop, Louisiana.
Status: Pending FPC approval.
Project: 30-mile, 36-in. main line loop, Mississippi.
Status: Pending FPC approval.
Project: 17-mile, 36-in. main line loop, Alabama.
Status: Pending FPC approval.
Project: 7-mile, 36-in. main line loop, Georgia.
Status: Pending FPC approval.
Project: 15-mile, 36-in. main line loop, South Carolina.
Status: Pending FPC approval.
Project: 20-mile, 36-in. main line loop, North Carolina.
Status: Pending FPC approval.
Project: 28-mile, 36-in. main line loop, Virginia.
Status: Pending FPC approval.
Project: 27-mile, 36-in. main line loop, Maryland.
Status: Pending FPC approval.
Project: 69-mile, 24-in. storage line, Pennsylvania.
Status: Pending FPC approval.
Project: 37-mile, 3-8-in. offshore line, Louisiana.
Status: Pending FPC approval.

TRANSWESTERN PIPELINE CO., 618 First City National Bank Building, Houston 2, Tex.

★ Project: 41-mile, 8-in., and 6-mile, 4 in., from Bluitt gasoline plant to Panhandle lateral.
Completion: Aug. 15, 1961.
Contractor: McVean & Barlow, Inc.
Project: Gathering system in West Texas and Panhandle areas, 6 miles, 12-in.; 7 miles, 10-in.; 33 miles, 8-in.; 145 miles, 6-in.; 237 miles, 4-in.
Status: Under way.
Completion: December 1961.
Contractor: Sheehan Pipe Line Construction Co.

TRUNKLINE GAS CO., Box 1642, Houston, Tex.
Project: 21-mile, 30-in. line from LaCenter to Columbus, Ky.
Contractor: Western Pipe Line, Inc.
Completion: June 10, 1961.
Project: 21-mile, 30-in. line from New Dennison, to Vienna, Ill.
Contractor: Western Pipe Line, Inc.
Completion: June 20, 1961.
Project: 21-mile, 30-in. line north of Deridder, La.
Contractor: Panama, Inc.
Completion: Late spring, 1961.
Project: 21.4-mile, 30-in. line from Vienna to Marion, Ill.
Completion: 1961.
Project: 21-mile, 30-in. line from Dry Creek to Pitkin, La.
Completion: 1961.
Project: 76 miles, 26-in. from Longville to Cow Island, La.
Completion: 1961.
Project: 52 miles of 20-in. from Bayou Sale to Cow Island, La.
Completion: 1961.

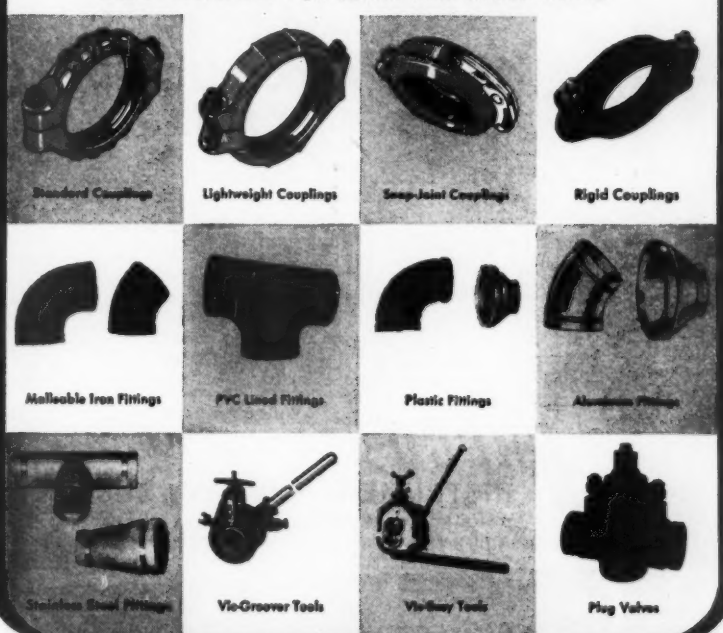
UNITED GAS PIPE LINE CO., Box 1407, Shreveport 92, La.
Project: 217 miles of 30-in. from St. Mary Parish to near Monroe, La.
Status: Pending FPC approval.
Completion: Late 1961.
Project: 59 miles of 36-in. purchase lat-

VICTAULIC®
The Time-and Job-Proven Method of Reducing Piping Costs

NEW PLAINLOCK COUPLINGS AND FITTINGS
For Low Cost Jointing of Plain End Pipe

- Speed Installation — Save Time and Labor — Cut Piping Costs
- No pipe end preparation
- Positive grip of pipe ends
- Low cost couplings and fittings
- Join standard or light wall carbon or stainless steel, aluminum and other piping materials

CUT COSTS WITH OVER 1100 VICTAULIC ITEMS FOR BETTER AND EASIER PIPING



For complete information on any Victaulic product, write
VICTAULIC COMPANY OF AMERICA

PIPELINE CONSTRUCTION

eral connecting Bastian Bay field, Louisiana.
Status: Temporarily approved by FPC.
Completion: Fall 1961.

WASHINGTON GAS LIGHT CO., 1100 H St., NW, Washington 5, D. C.
Project: 10.99 miles, 16-in. gas line near Lanham, Mo., and Lanham to Belair, Md.
Completion: September 1961.
Project: 20.66 miles various size distribution lines, Belair, Md.
Completion: September 1961.
Project: 15.5 miles, 24-in. gas line at Hybla Valley, Va.
Completion: October 1961.
Project: 16 miles of 24-in., from near Alexandria, Va., to Prince Georges County, Maryland.
Status: Approved by FPC.

WESTERN SLOPE GAS CO., Denver, Colo.
Project: 7-mile, 4-in. gas line from Powell Park field to Meeker, Colo.; 4-mile, 4-in. line from Section 11T7SR94W to Rifle, both to be completed by July 15, and 6 miles of 4-in. gathering lines to be completed by September 1.

U. S. Miscellaneous Pipelines

MONSANTO CHEMICAL CO., 800 North Lindbergh Blvd., St. Louis 66, Mo.
Project: 25-mile lines to move petrochemicals between proposed plant at Chocolate Bayou and Texas City.
Status: Planned.

SUNOLIN CHEMICAL CO., 1608 Walnut St., Philadelphia 3, Pa.
Project: Ten 8-in. chemical lines from SunOlin's plant at Claymont, across the Delaware River to Penns Grove, N. J.
Status: Planned.
Completion: Late 1961.

TEXAS EASTERN TRANSMISSION CORP., Box 1189, Houston 1, Tex.
Project: 350 miles of 24-in. coal-slurry line to move West Virginia coal to electric companies in Pennsylvania, New York and New Jersey. (Texas Eastern is working jointly with Consolidation Coal Co., Pittsburgh, Pa.)
Status: Proposed.

Canadian Crude Oil Pipelines

BITUMINOUS OIL PIPELINE CO. (Royalite Oil Co., Ltd., Royalite Building, Calgary.)
Project: A 250-mile line from Athabasca oil sands to Edmonton.
Status: Proposed.

HUDSON'S BAY OIL & GAS CO., LTD., 320 7th Ave., Calgary, Alta.
Project: 41 miles of 4 and 8-in. condensate line from the Waterton-Castle River area and Pincher Creek field in southwestern Alberta to Carway near the U. S. border to connect with Continental Pipe Line's Glacier crude system in Montana and Wyoming.
Status: Pending approval. (Aurora Pipe Line Co., to operate line.)

INTERPROVINCIAL PIPE LINE CO., Edmonton, Alta.
★ Project: 90-mile lateral, Hamilton, Ont., to Buffalo, N. Y.
Status: Filed with CNEB.

MATADOR PIPE LINE CORP., Denver, Colo.
Project: 175-mile line from Burke, Bottineau, and Renville counties, North Dakota, to Cromer, Man.
Status: Proposed. (See U. S.)

MID-CONTINENT PIPE LINES, LTD., Edmonton, Alta.
Project: 1,500 miles of 30-in. from Edmonton to Chicago. U. S. section to be owned by International Oil Pipeline Corp., New York City.
Status: Pending Canadian Board of Transport Commission approval.

RANGELAND PIPE LINE CO., Calgary.
Project: 111-mile line from Cessford field to Calgary.
Status: Pending approval of Alberta government.

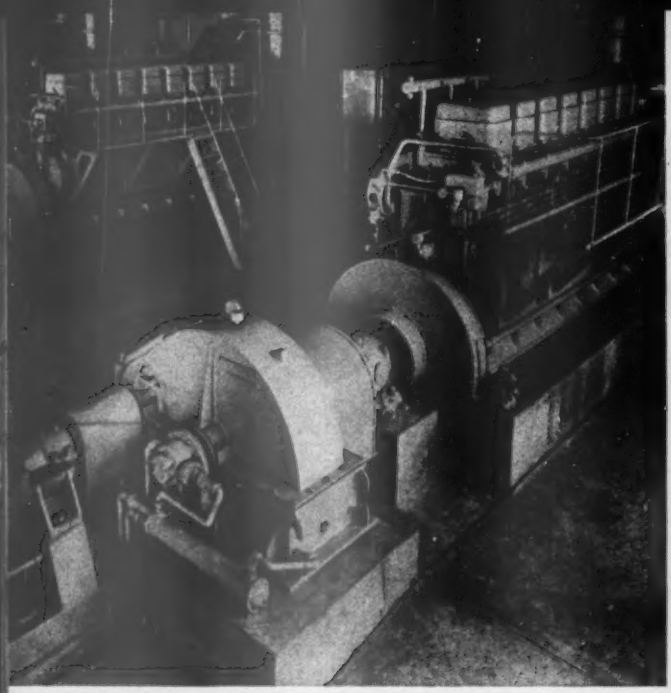
TRANS-PRAIRIE PIPELINES, LTD., 12912 125 Ave., Edmonton, Alta.
Project: Expansion of gathering system in British Columbia, 40 miles, 4-in. from Taylor to Dawson Creek; 30 miles, 6-in. from Boundary Lake to Taylor. 75 miles, 8-in. from Taylor to Milligan Creek, 11 miles, 4-in. from Milligan Creek to West Beaten; and 4 miles, 8-in. near Taylor station.
Status: Under way.
Contractor: Banister Construction Co., Ltd., Edmonton.
Completion: Fall, 1961.

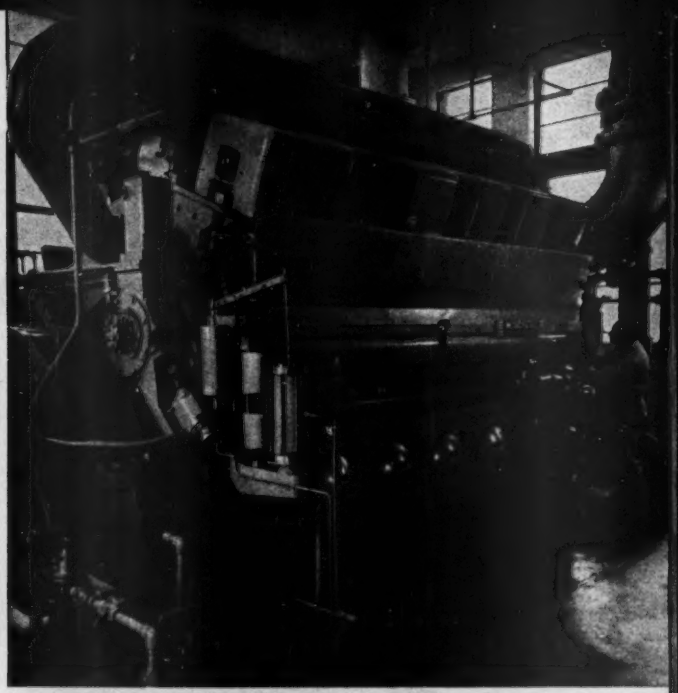
WESTERN PACIFIC PRODUCTS & CRUDE OIL PIPELINES, LTD., 1155 West Georgia St., Vancouver 5, B. C.
Project: 500-mile, 12-in. from Taylor, B. C., to Kamloops to connect with the Trans Mountain line to Vancouver.
Status: Under way.
Contractors: Canadian - Bechtel, north; Dutton-Williams, south.
Completion: Late 1961.

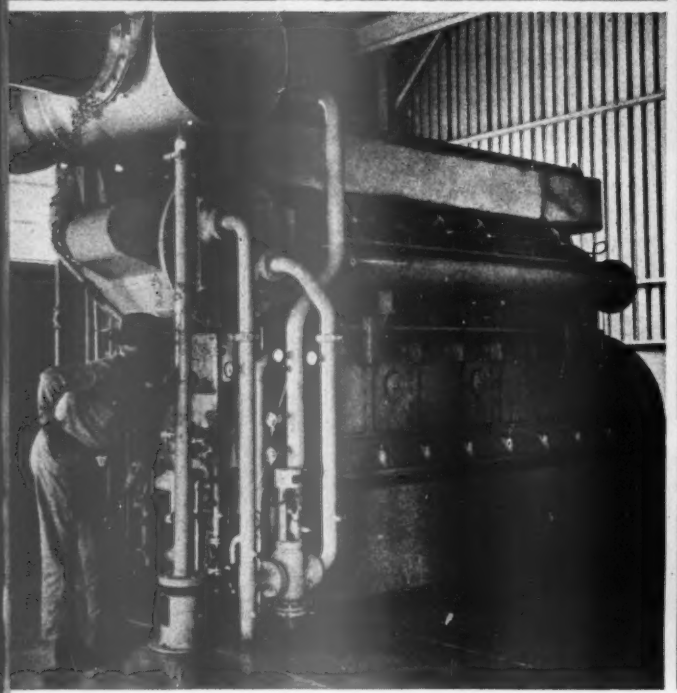
Canadian Products Pipelines

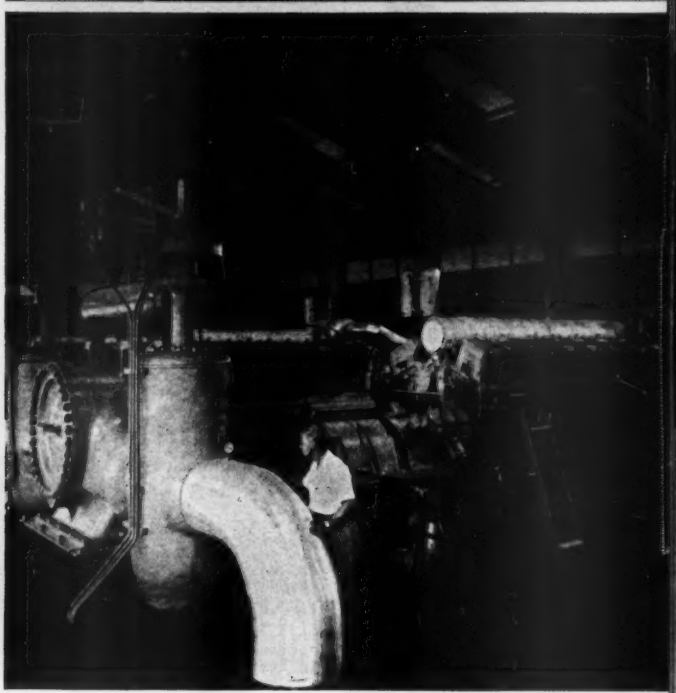
ALBERTA GAS PRODUCTS SYSTEM, LTD., Calgary, Alta.
Project: 725-mile, 8-10-12-in. natural gas

NOW...
ACCURATE,
DEPENDABLE
FLUID
SAMPLING
WITH THE
ARCCO LIQUID
SAMPLER
The new ARCCO Liquid Sampler offers a simple, accurate and convenient method of collecting samples of liquid flowing in pipelines. Each sample is of equal volume with a full cross section of fluid—eliminating error due to stratification of liquid.
Here are other important features:
• Nothing to drain, clean or bleed before taking samples • Samples taken at line pressure and stored at atmospheric pressure • Samples are taken without interrupting flow of liquid in line • Samples are obtained either manually or automatically.
Write for more information
Ask for Bulletin 103.
ARCCO
INSTRUMENT COMPANY, INC.
7144 EAST CONDOR STREET • LOS ANGELES 22, CALIF.
MANUFACTURERS OF PRECISION INSTRUMENTS









Pipe line engines by Nordberg

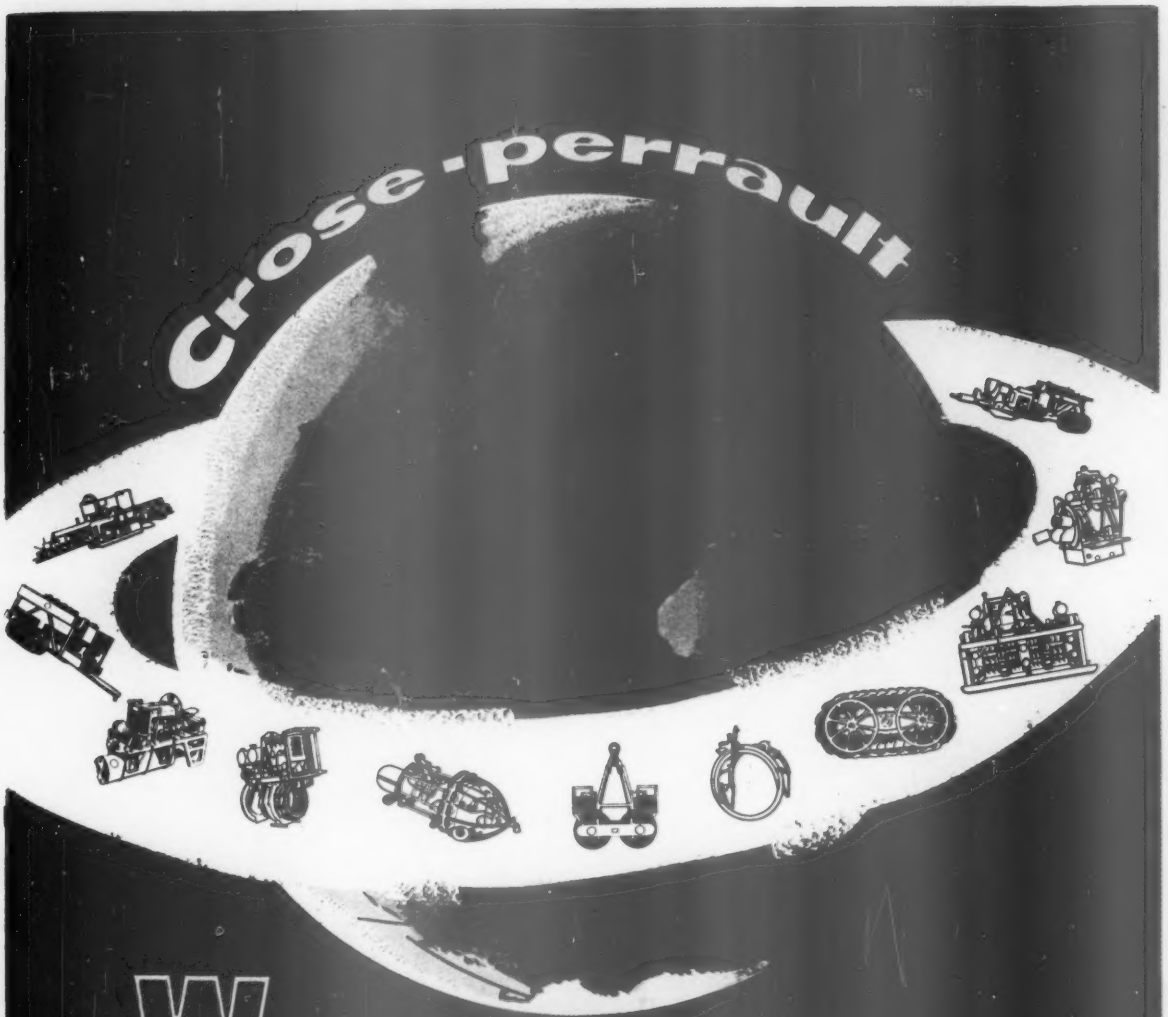
Nordberg engines are a sound investment in long term pipe line power.
Consult Nordberg on your crude, products or gas pipe line programs.

©1960, N.M.CO.

0-260-R

NORDBERG MANUFACTURING COMPANY
MILWAUKEE 1, WISCONSIN

ATLANTA • CLEVELAND • DALLAS • DULUTH • HOUSTON • KANSAS CITY • MINNEAPOLIS
NEW ORLEANS • NEW YORK • PHOENIX • ST. LOUIS • SAN FRANCISCO • TAMPA • WASHINGTON
WICHITA, • TORONTO • VANCOUVER • JOHANNESBURG • LONDON • MEXICO, D. F.



WORLDWIDE LEADER

PIPELINE EQUIPMENT, MATERIALS AND SUPPLIES

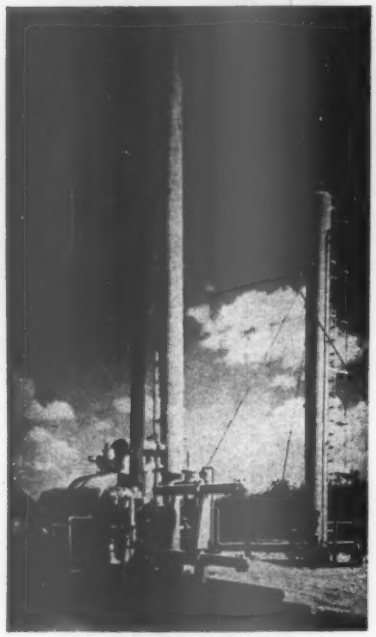
Crose-Perrault is the largest supplier of pipeline equipment in the world. Thousands of miles of pipeline experience with pipeline contractors throughout the world have earned Crose-Perrault this world wide leadership because of proven equipment, engineered and designed to deliver long term performance under the toughest conditions with maximum efficiency. Crose-Perrault is proud of its reputation as the most complete pipeline equipment source in the world.

ONE TELEPHONE CALL TO CROSE-PERRAULT IS ALL THAT'S NECESSARY.

Everything you need in pipelining from heavy equipment to miscellaneous supplies can be obtained by contacting Crose-Perrault.

REMEMBER
WEbster 6-2171

Sweeten Sour Gas More Economically



with the NEW MALONEY-CRAWFORD SWEET-A-MINE

Maloney - Crawford technology makes low-cost, highly efficient amine desulferization a reality with the new Sweet-A-Mine. Whether you have 400 MCF/D or 50 MMCF/D of sour gas, a Sweet-A-Mine will give you specification gas . . . with virtually no field attendance.

The Sweet-A-Mine is in two assemblies—absorber and regenerator. The sour gases are absorbed in a solution of monoethanolamine and water, then the sour amine solution is regenerated for re-use. A special feature is a reflux condensing coil that boosts the efficiency of the regenerating process.

With these advances in mind, re-examine your sour gas problems. Tell us your conditions. M-C engineers have the answer. Contact them.

Maloney-Crawford

P. O. Box 659 Tulsa, Okla.

PIPELINE CONSTRUCTION

liquids gathering system in Alberta to connect with Interprovincial and Trans Mountain at Edmonton and to deliver to U. S. border.
Status: Before Alberta Conservation Board.

BRITAMOIL PIPE LINE CO., LTD., Box 130, Calgary, Alta.
Project: 126-mile 6-in. line from Pincher Creek to Calgary.
Status: Pending approval of the Alberta Oil and Gas Conservation Board.
Project: 64-mile 8-in. line from Dick Lake to Edmonton, Alta.
Status: Pending approval of the Alberta Oil and Gas Conservation Board.

FOOTHILLS PRODUCTS PIPE LINE LTD., (Pembina Pipe Line Co., Mannix Co., Ltd.), Calgary, Alta.
Project: 1,300 miles of 16-in. from Alberta to Chicago.
Status: Proposed. Standard Oil Co. (Ind.) will participate in the project.

HUGHENDEN PIPELINE.
Project: 125 miles from Dick Lake gasoline plant to underground storage in the Hughenden region of eastern Alberta.
Status: Pending approval of Alberta Oil and Gas Conservation Board.

HYDROCARBONS PIPELINE, LTD., 239 Sixth Ave., SW, Calgary, Alta.
Project: 503-mile, 4 to 12-in. gathering system, with deliveries to Calgary, Innisfail, Hughenden, and Interprovincial Pipe Line Co.
Status: Pending approval of Alberta government.

PROVINCIAL PRODUCTS PIPELINES, LTD.
Project: 700 miles of 4 to 12-in. condensate gathering system in Alberta.
Status: Pending approval of Alberta Oil and Gas Conservation Board.

ROYALITE OIL CO., LTD., Calgary, Alta.
Project: 25-mile, 4½-in. condensate line to join Jumping Pound and Wildcat Hills absorption plants with Valley Pipe Line near Calgary.
Status: Proposed.

WESTALTA PRODUCTS PIPELINE, LTD., (Pembina Pipe Line, Ltd., Edmonton, Alta.).
Project: 885-mile 4 to 16-in. gathering system to take natural-gas liquids from plants in Alberta for delivery to proposed Foothills trunkline to Great Lakes area.
Status: Pending approval of Alberta Board of Public Utility Commissioners. Standard Oil Co. (Ind.) will participate in the project.

Canadian Natural Gas Pipelines

ALBERTA GAS TRUNK LINE CO., LTD., Calgary, Alta.
Project: 226 miles of 36-in. and 125 miles of 30-in., plus laterals in southern Alberta including 58 miles of 22-in. and 64 miles of 16-in. (Part of a 1,400-mile system Alberta to San Francisco.)
Contractors: Majestic Contractors, Ltd., Edmonton, has 113 miles of 36-in. from Crowsnest Pass to Priddis, 63 miles of 30-in. from Rocky Mountain House to Cynthia, and 38 miles of 22-in. lateral to the Rimbey region. Mannix Co., Ltd., Calgary, has 113 miles of 36-in. from Priddis to Rocky Mountain House. Dutton-Williams Brothers, Ltd., Calgary, has 62 miles of 30-in. from Cynthia to near Whitecourt, Alta., as well as a 20-mile, 22-in. lateral to the Whitecourt area. Piggott Construction, Ltd., Edmonton, has 64 miles of 16-in. lateral

Power Chief® Oil Field Engines for production pumping

Actual on-the-job operating figures have proved that Power Chief gas engines consistently establish records of reliability and low maintenance. Records show over 43,000 hours of continuous pumping operation with original rings, pistons, liners, valves, bearings and crankshafts still in place.

Built in 1, 2 and 3-cylinder models, these rugged medium-speed units are ideal for production pumping and water flooding service in sizes up to 54 hp, max.

NORDBERG MANUFACTURING COMPANY

Milwaukee 1, Wisconsin

©1960 N.M.CO. PC460

Project: 325,000 kw power plant for Arkansas Power & Light Company. Prime Contractor: Ebasco Services Inc. Sub-Contractor: Grafe-Weeks Corporation. Electrodes: Airco.

AIRCO LOW HYDROGEN ELECTRODES USED ON HIGH TENSILE PIPE WELDING *at giant new power station*

AIRCO LOW HYDROGEN ELECTRODES were used by Grafe-Weeks Corporation to weld the hundreds of feet of high pressure piping in the giant new steam turbine power plant of the Arkansas Power and Light Company at Helena on the Mississippi.

Why? . . . Because Airco low hydrogen electrodes provide an easily directed arc specifically designed to meet requirements of high pressure pipe welding . . . They also deliver X-ray quality deposits under tough conditions.

Ask for a shop demonstration. Would you like to see Airco electrodes put to the test? Let your Airco salesman or distributor arrange a demonstration at your convenience . . . using Airco low hydrogen electrodes or any other group of Airco electrodes. Call Airco, or look in your Classified Telephone Directory under "Welding Equipment and Supplies" for your nearest Authorized Airco Distributor.

AIRCO®

AIR REDUCTION SALES COMPANY

A division of Air Reduction Company, Incorporated

150 East 42nd Street, New York 17, N. Y.

More than 700 Authorized Airco Distributors Coast to Coast

On the west coast—
Air Reduction Pacific Company
Internationally—
Airco Company International
In Canada—
Air Reduction Canada Limited
All divisions or subsidiaries of Air Reduction Company, Inc.

For your low hydrogen welding— Airco electrodes meet every critical need

Here are the Airco low hydrogen headliners — from a total of more than 100 Airco electrode types in more than 400 sizes and designs —

AIRCO 312 AWS-ASTM E60-7016. For welding higher strength alloy or carbon steels. Also high sulfur content steels. Designed to overcome "underbead cracking." Lessens need for high preheat or stress-relieving postheat.

AIRCO 396 AWS-ASTM E8016-C1. For welding the 2½% to 3½% nickel steels used in low temperature jobs. Also for nickel bearing steels, to provide uniform chemistry at joints with minimum difficulty. No high preheat needed.

AIRCO 395 AWS-ASTM E8016-C3, A 1% nickel type of low hydrogen electrode. Also for nickel bearing steels where good low temperature properties can be attained; high sulfur content steels; grade HT and similar high tensiles.

AIRCO 394 AWS-ASTM E10016-D2. For welding manganese-molybdenum high strength steels such as A-302 Grade B.

AIRCO 354 AWS-ASTM E8016-B2. For welding 1% chrome 5% molybdenum steels used for pressure vessels in high temperature service; and for castings of similar analysis.

NOW — "Barrier Carton" bars moisture damage. Special aluminum foil interlining in new carton now protects dryness of Airco low hydrogen electrodes *8 times better than regular style carton.* If your application can't tolerate moisture damage...specify Airco.

AIRCO

AIR REDUCTION SALES COMPANY

A division of Air Reduction Company, Incorporated
150 East 42nd Street • New York 17, N. Y.

PIPELINE CONSTRUCTION

from Crowsnest Pass to Carway, Alta., on the U. S. border.
Completion: Dec., 1961.
Projects: Laterals to tie in with the above project: 15 miles of 12-in. to Buck Lake. 23 miles of 22-in. to East Calgary, 15 miles of 16-in. to Carstairs, 4 miles of 8-in. to Sarcee, and 10 miles of 10-in. built will connect Kaybob, Berland River, Lovett River, and Stolberg.

ALBERTA NATURAL GAS CO., LTD. (Pacific Gas & Electric Co., San Francisco, and Westcoast Transmission, Calgary.)
Project: 108 miles of 36-in. from Crowsnest Pass across southeastern British Columbia to the U. S. border near Eastport, Idaho. (Part of 1,400-mile project from Alberta to San Francisco.)
Contractor: Price Poole of Canada, Ltd. (Canadian Bechtel, Inc., Toronto, is engineering manager.)
Completion: Dec., 1961.

CANADIAN INDUSTRIAL GAS, LTD. (formerly Ajax Petroleums, Ltd.), Derrick Building, Calgary, Alta.
Project: 28 miles of 10-in. and 4 miles of 8-in. from Morinville to Westlock Viking San field.
Status: Planned.
Completion: By September 1961.

CARTIER GAS CORP. (St. Maurice Gas Inc., and Consumers Gas Co., 19 Toronto St., Toronto.)
Project: Transmission and distribution in eastern townships and through to Quebec City in Quebec Province.
Status: Proposed.

GAS TRUNK LINE OF BRITISH COLUMBIA, LTD., Pacific Bldg., Calgary, Alta.
Project: 245-mile, 30-in. extension of Westcoast Transmission system from Taylor, B. C., to Fort Nelson.
Status: Delayed to 1963 or 1964.

MAGNA PIPELINE CO., LTD., Nanaimo, Vancouver Island, B. C.
Project: 53 miles of parallel 7-in. reinforced plastic pipe to serve Vancouver Island, B. C.
Status: Approved.
Completion: 1963.

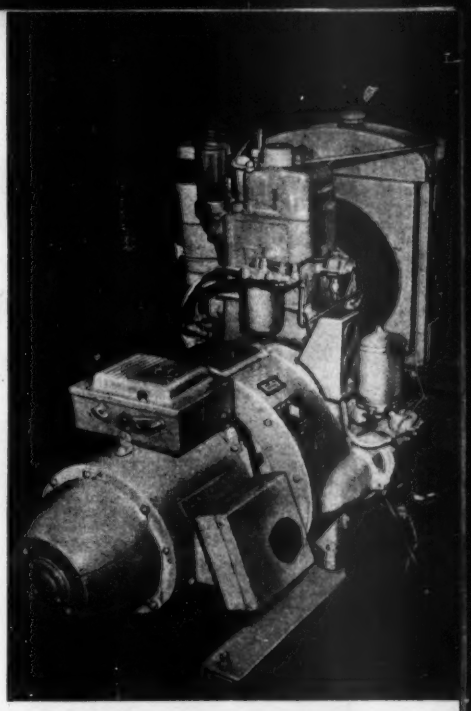
NORTHERN ALBERTA PIPE LINES, LTD., Edmonton, Alta.
Project: 110-mile trunk line, plus gathering system, from Lac La Biche, in McMurray vicinity, to Edmonton.
Status: Pending provincial approval.

ONTARIO NATURAL GAS STORAGE & PIPELINES, LTD., Catham, Ont.
Project: 14 miles, 10-in., 7 miles, 4-in. transmission line from Waterloo to Fergus, Ont., and 63 miles, 2-6-in. distribution lines.
Completion: August 1961.

SARATOGA PROCESSING CO., LTD., 406 Petroleum Building, Calgary, Alta.
Project: 67 mile gathering system (43 miles 16-in., 24 miles 4-10-in.) for Coleman, Alta., processing plant.

SASKATCHEWAN POWER CORP., Regina, Sask.
Project: Line from Canora to Preeceville, Sask., 20.07 miles 6-in. and 15.15 miles 4-in.
Status: Planned.

WESTCOAST TRANSMISSION CO., LTD., Calgary, Alta.
Project: 688-mile, 30-in. loop of British Columbia-Washington line.
Status: Proposed.
Project: (See Alberta Natural Gas Co., Ltd., for joint project.)



Power Chief. oil field engines for rig lighting

Power Chief Diesel Electric Generator Sets are furnishing reliable lighting on large and small rigs. These sturdy units can stand the gaff of continuous service, night after night, without constant attention and maintenance.

Built in 1, 2 and 3-cylinder sizes, Power Chief Diesels develop from 10 to 45 hp, 5 to 30 kw, in all standard AC and DC voltages . . . and are available with special vibration-proof mounting for rig installation.

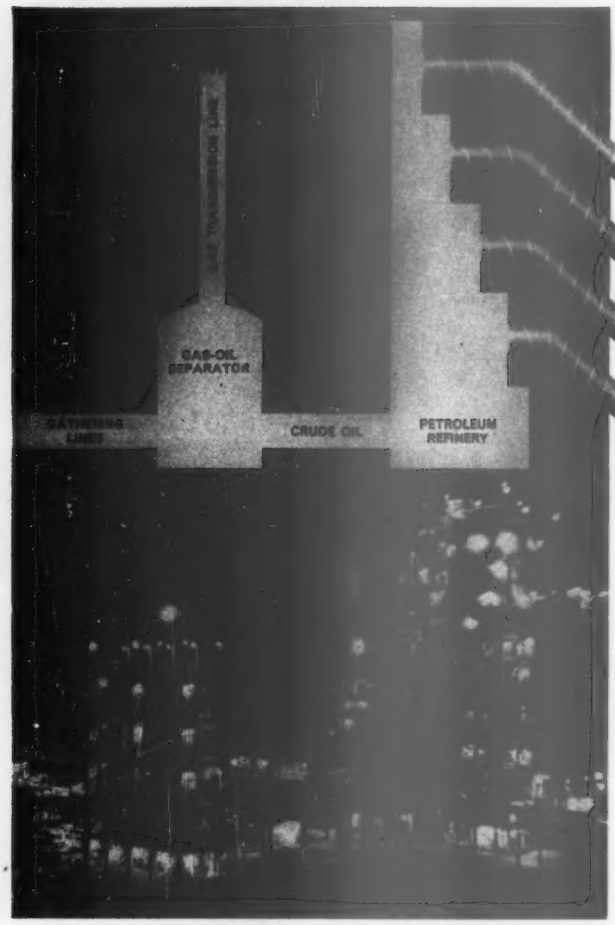
NORDBERG MANUFACTURING COMPANY

MILWAUKEE 1, WISCONSIN

© 1960, N.M.CO. PC360

Polyken tape protects products lines

for this big Petro Company



Another convinced user learns the money-saving versatility of one of the world's incredibly tough tapes

Phillips Petroleum Company chose Polyken No. 960 Extra-Strength Pipeline Tape to protect its products lines. This is why:

- Polyken 960 is a *dependable* pipeline coating. It is easy to handle, simple to apply, resulting in a reliable, quality installation.
- It is *especially* suited to construction of short lines and close work, as on these pipelines carrying crude oil fractions.
- It utilizes high-density polyethylene for maximum durability and corrosion resistance.
- It stands up under tough conditions of terrain and climate—experience-proved in many, many thousands of squares installed throughout the world, in plains, deserts, mountains, swamps.
- Its cathodic protection requirements are low.

AND . . .

- It saves money: Polyken 960 goes on fast with less men per job, covers more miles per day. Less equipment, less handling costs. More savings over the old hot dope idea.

See your Polyken Man . . . call your Polyken Tape Coating Distributor . . . or write Polyken, 309 West Jackson Blvd., Chicago 6, Illinois.

©1960 The Kendall Company

Phillips pipe is cleaned and wrapped by Brodie Construction Company in a single factory-smooth operation. No primer, no drying or cooling. No fumes or fire hazards.

Polyken®

EXPERIENCED IN PROTECTIVE COATINGS

THE KENDALL COMPANY
Polyken Sales Division

POLYKEN PROTECTIVE COATINGS DISTRIBUTORS

Atlanta, Georgia
Steele & Associates, Inc.

Billings, Montana
Western Corrosion Service

Chicago, Illinois
Sales Engineering, Inc.

Cicero, Illinois
Midland Pipe & Supply Co.

Cincinnati, Ohio
Hare Equipment

Cleveland, Ohio
The Harco Corp.

Denver, Colorado
Patterson Supply Co.

Houston, Texas
Cathodic Protection Service

Jackson, Michigan
Utility & Industrial Supply Co.

Kansas City, Missouri
H. J. Hodes Co.

Long Beach, California
Barnes & Delaney

Memphis, Tennessee
General Pipe & Supply Co.

Minneapolis, Minnesota
Simcoe Equipment Co.

New Orleans, Louisiana
L. F. Gaubert & Co.

Philadelphia, Pennsylvania
Harold N. Davis Co.

Plainfield, New Jersey
Stuart Steel Protection Corp.

San Francisco, California
Incandescent Supply Co. of Calif.

Spokane, Washington
Jan-Tan Corp.

St. Louis, Missouri
Corrosion Products, Inc.

Tulsa, Oklahoma
Midwestern Pipe Line Products Co.

Polyken

Experienced in modern PROTECTIVE COATINGS

PIPELINE CONSTRUCTION

Foreign Crude Oil Pipelines

ABU DHABIE MARINE AREAS, LTD. (partly owned by British Petroleum Co., Britannic House, Finsbury Circus, London E.C. 2).
Project: 20 miles of 18-in. from offshore Persian Gulf pool to Das Island.

ALGERIAN LINES.
Project: 75-mile 10-in. line to link the new oil field, El Gassi-El Agreb, with the existing Hassi Messaoud-Bougie line. SNPA is field operator.
Status: Planned.

AMINOIL, Mena Abdulla, Kuwait
Project: 33-mile, 24-in. from Wafra to Mina Abdulla, Kuwait.
Completion: August, 1961.
Contractor: Contracting & Trading Co.

ARABIAN AMERICAN OIL CO., 505 Park Ave., New York 22.
Project: 27-mile, 24-in. crude line from northern Safaniya to southern Safaniya.
Status: Planned.
Completion: Second quarter, 1962.
Contractor: Aramco-Bechtel.

ATTOCK OIL CO., LTD., Morgah, Rawalpindi, West Pakistan.
Project: 55-mile, 6-in. line from Dhulian field to Morgah refinery.
Completion: July 1961.
Contractor: Motherwell Bridge Contracting and Trading Co., Ltd.

BASRAH PETROLEUM CO., London, England.
Project: 20 miles, 16-in. gathering lines, Rumaila.
Contractor: Mothercat Co., Ltd.
Completion: Sept., 1961.
Project: 37-mile line from Rumalia field to power plant at Basra.
Status: Contract let.
Completion: March 1962.
Contractor: SAIPEM.

CIE. de RECHERCHE et d'EXPLOITATION PETROLIERE au SHARA, Paris.
Project: 40 miles, 4-8-in. gathering lines, El Adeb Larache field.
Status: Proposed.
Contractor: Socoman.
Completion: January, 1962.

COUNCIL FOR MUTUAL ECONOMIC AID (Comecon).
Project: 2,800-mile system from the Volga-Ural oil fields in Russia to East Europe satellite countries.
Status: Construction under way in Poland, Hungary, and Czechoslovakia.

ESSO STANDARD (LIBYA), INC.
Project: 100 miles of 30-in. from Zelten field to Gulf of Sirte.
Status: Under way.
Contractor: Arabian Bechtel Corp.
Completion: Mid-1961.

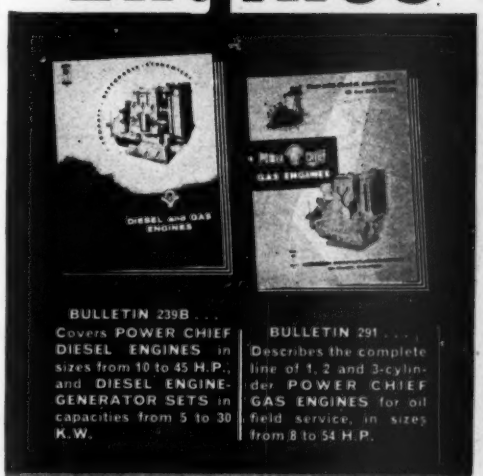
GERMAN LINE planned by eight German refining and marketing companies (British Petroleum, Esso, Deutsche Erdoel, Shell, Gelsenberg-Benzin, Mobil, Schloven-Chemie, and Wintershall).
Project: 155-mile, 24-in. line to Bavaria from Karlsruhe.
Status: Planned.

IRANIAN OIL EXPLORATION & PRODUCING CO.
Project: 30 miles of 20-in. and 22 miles of 16-in. looping of Agha Jari to Bander Mashur line.
Status: Planned.

IRAQ PETROLEUM CO.
Project: Two 25-mile, 32-in. crude lines to offshore loading dock in Persian Gulf.
Status: Under way.

IRAQ PETROLEUM CO., LTD., 214 Oxford St., London W 1, England.
Project: Looping of Kirkuk-Mediterranean

These bulletins will give you complete details on Power Chief® Oil Field Engines



BULLETIN 239B . . . Covers POWER CHIEF DIESEL ENGINES in sizes from 10 to 45 H.P., and DIESEL ENGINE-GENERATOR SETS in capacities from 5 to 30 K.W.

BULLETIN 291 . . . . Describes the complete line of 1, 2 and 3-cylinder POWER CHIEF GAS ENGINES for oil field service, in sizes from 8 to 54 H.P.

Send for your copies today!

NORDBERG MANUFACTURING COMPANY
Milwaukee 1, Wisconsin

Pipe to studs from one economical source–

REPUBLIC SUPPLY!

No warehouse problems, no costly inventory to maintain, no time consuming task of ordering from multiple sources when you buy from one—REPUBLIC SUPPLY.

For your pipeline supplies—from pipe to studs—contact the local REPUBLIC SUPPLY representative in your area. He'll save you time and money!

REPUBLIC SUPPLY COMPANY

GENERAL OFFICES: OKLAHOMA CITY, OKLAHOMA

EXPORT REPRESENTATIVES

Val R. Wittich, Inc.
30 Rockefeller Plaza
New York City, New York

Matpetrol
Esmeralda 155, Piso 8
Buenos Aires, Argentina

a Subsidiary of

REPUBLIC STEEL

CLEVELAND 1, OHIO

PIPELINE CONSTRUCTION

system 66-mile between K-1 and K-2 stations and 81-mile between K-3 toward Syria. In Syria, a 28-mile section of 30-in. is under way.

KUWAIT OIL CO., LTD., Burgan House, London, England.
Project: 31-mile, 24-in. crude line from Minagish to Ahmadi South tank farm.
Status: Planned.

MENE GRANDE OIL CO., Apartado 709, Caracas, Venezuela.
Completion: Mid-1962.
Project: 16-in. line at Block 11, Maracaibo.
Completion: December 1961.

OASIS OIL CO. OF LIBYA, 1270 Avenue of the Americas, New York 20, N. Y.
Project: 86-mile, 30-in. from Dahra field to El Sider; 36-mile, 20-in. from Mabruk to 30-in. line.

OIL INDIA, LTD. (Burmah Oil Co. and Assam Oil Co., two-thirds, and India Government, one-third.)
Project: 720 miles in northeast India, 250 miles of 16-in. from Nahorkatiya to Noonmati and 470 miles of 14-in. from Noonmati to Barauni.
Contractors: Mannesmann, Germany, and SAIPEM, Italy.
Status: Under way.
Completion: 16-in. system, 1961.

PETROLEO BRASILEIRO S.A. (Brazil).
Project: 250-mile line from Rio de Janeiro to Belo Horizonte refinery site.
Status: Under consideration.
Project: 35 miles of 8 to 12-in. pipe from Buracica to Candeia.
Contractor: Techint, Inc., Milan, Italy.
Project: 80 miles of 24-in. to tie in to proposed Caxias refinery near Rio de Janeiro.
Status: Planned.

HOLD THAT RIVER!
Engineering Co.
RIVER BANK EROSION CONTROL
ENGINEERS CONTRACTORS
BOX 218 PHONE 693
PAULS VALLEY OKLAHOMA

PHILLIPS PETROLEUM CO., Bartlesville, Okla.
Project: 14-in. line in Block 17, Lake Maracaibo, Venezuela.
Status: Planned.
Contractor: Chicago Bridge & Iron Co.

ROYAL DUTCH-SHELL.
Project: 12-mile line from Gore Bay, Australia, to Royal Dutch-Shell's Clyde refinery.
Status: Planned.
Project: 161 miles 20-in. line from Tandzung field to Balikpapan refinery, Borneo.
Status: Planned.
Contractor: Williams Brothers Overseas, Ltd., Tulsa, and John Brown, Ltd., London.
Completion: January 1, 1962.

SINCLAIR VENEZUELAN OIL CO., Apartado 1706, Caracas, Venezuela.
Project: 17.35 miles, 8-in. crude line from East Aguasay to south bank of Tonoro River to connect with existing 8-in. line.
Status: Planned.
Completion: Late 1961.

SNAM-SUEDPETROL, Milan, Italy.
Project: 20-in. crude line from Genoa to Ingolstadt, Austria, via Switzerland.
Status: Planned. Construction expected to begin in 1961.

SOUTH EUROPEAN PIPELINE CO. (Jersey Standard, Caltex, Shell, British Petroleum, and 12 other firms.)
Project: 419-mile, 30 in. line from Lavera, near Marseille, to Strasbourg, with 40-mile extension to Karlsruhe, Germany. This may be extended into lower Batavia with a 155-mile, 22-in. segment.
Status: Under way.
Completion: 1963.

SYRIAN LINE.
Project: About 320 miles of 6-in. from interior of Syria to link Homs refinery with various fields.
Status: Under way.
Contractor: Techint, Inc., Milan, Italy.
Completion: 1962.

UNION OF SOVIET SOCIALIST REPUBLICS.
Project: 2,315-mile, 28-in. Trans-Siberian crude-products line from Ufa and Tuimazy fields, Bashiria, to Irkutsk.
Status: Under way.

YACIMIENTOS PETROLIFEROS FISCALES (Argentina), Buenos Aires.
Project: 390 miles, 14-in. from Neuquen Province to Bahia Blanca.
Status: Under way.
Project: 625 miles of 12-in. from Mendoza to San Lorenzo.
Status: Planned.

UNION OF SOVIET SOCIALIST REPUBLICS.
Project: 2,315 miles of 29-in. Trans-Siberian crude-products line from Ufa and Tuimazy fields in Bashiria to Irkutsk.
Status: Under way.
Project: 700 miles from Novo-Kuibyshev refinery to Bryansk.
Status: Under way.

YACIMIENTOS PETROLIFEROS FISCALES (Argentina), Buenos Aires.
Project: 652 miles of 10-in. from Lujan de Cuyo to Buenos Aires.
Status: Planned.

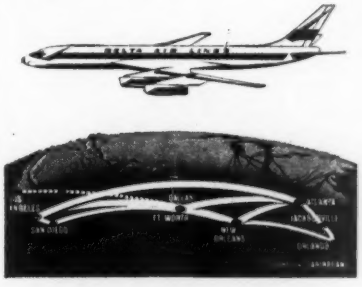
Foreign Products Pipelines

ARABIAN AMERICAN OIL CO., Dhahran, Saudi Arabia, and 505 Park Avenue, New York.
Project: 37 miles of 8-in. LPG line frrom Abqaik to 'Ain Dar.
Contractor: Aramco-Bechtel.
Completion: 1961.

CIE. FRANCAISE DE PETROLES, Paris,

DELTA
announces a New Southern Transcontinental Jet Route linking California with the Southeast

Now 6 Jet flights daily between Los Angeles and Atlanta! Non-stop service in slightly more than 4 hours ... other jet service links Los Angeles and Atlanta by way of Dallas / Ft. Worth and New Orleans. Plus new thruplane DC-7 service linking San Diego with Jacksonville and Orlando, via Dallas / Ft. Worth and New Orleans. Effective July 1, Delta service to Las Vegas.



Delta's new routes to the West Coast

DELTA
A New Southern Transcontinental Route

BIG....

A word which applies to both this particular pipeline job, shown being laid by an R. H. Fulton & Company spread, and to the oil industry this firm has served for more than 20 years.

R. H. Fulton is constantly striving to improve methods and means to build better, faster, and more economical pipelines.

R. H. FULTON & CO.

CONTRACTORS

LUBBOCK, TEXAS

PIPELINE CONSTRUCTION

France.
Project: 187-mile, 8-in. condensate line from Hassi R'Mel dehydration plant to Haoud-el-Hamra station on Hassi Messaoud-Bougie crude oil line.
Status: Under way.

INDIA GOVERNMENT.
Projects: 600-mile line from Barauni to Delhi via Kanpur, Lucknow, and Allahabad; 300-mile dual crude and products line from Bombay to Bhusaval; 120-mile products line from Bombay to Poona to be extended 300 miles, later, to Hyderabad; and a 350-mile products line from Cochin to Madras via Bangalore.
Status: Proposed.

NATIONAL IRANIAN OIL CO., Tehran, Iran.
Project 360 miles of 8-in. from Rey to Meshed, Iran.
Status: Under way.
Contractor: William Brothers, Tulsa.

PETROLEOS MEXICANOS, Avenida Juarez 92-94, Mexico City, Mexico.
Project: 500-mile line from Minatitlan to Mexico City.
Status: Planned, with construction starting in 1961.
Completion: 12 to 18 months after construction starts.
Project: 270 miles of 8-in. from Torreon to Chihuahua.
Status: Under way.
Completion: September 1961.

PIPELINES OF PUERTO RICO, San Juan.
Project: 95 miles 8-in. from Penuelas to Catano.
Status: Approved by PSC.

SYRIAN PIPELINE.
Project: About 310 miles from Homs to tank farms in the Damascus, Aleppo, and Latakia areas.

the
SPREAD
is the thing . . .

. . . that makes the difference. The **spread** between a first class job and a mediocre one is simply this . . the **spread** between close attention to details and a slip-shod operation.

Sheehan Spreads are famous for their close attention to details as well as friendly relations with property owners. From the first estimate to final clean-up, Sheehan's careful planning and efficient operation is aimed at making sure your job is a job well done.

Sheehan SPREADS . . . the mark of quality in pipeline construction

SHEEHAN PIPE LINE CONSTRUCTION CO
TULSA OKLA

SHEEHAN

NATIONAL BANK OF TULSA BUILDING
TULSA, OKLAHOMA

Foreign Natural Gas Pipelines

BASRAH PETROLEUM CO., LTD., 214 Oxford St., Oxford Circus, London W. 1, England.

GASES NATURALES DE COLOMBIA, S.A. (Owned 50% by Colombian Petroleum Co., is affiliated with Mobil International and Texaco, and 50% local.)
Project: 140 miles of 10-in. from Cicuco field to Barranquilla.
Completion: Late 1961.

INTERNATIONAL GAS CO., Los Angeles, Calif.
Project: 1,840-mile, 30-in. gas line from Reynosa to Mexicali via Monterrey, Mazatlan, etc.
Status: Proposed.

ISRAEL GOVERNMENT and private interests.
Project: 75 miles of 16-in. to power a plant at Ashdod Yam on the Mediterranean coast.
Status: Planned.

NIOGAS, Vienna, Austria.
Project: 82 miles of 8 and 10-in. to connect Traismauer and Amstetten in Austria.
Contractor: Williams Brothers, Tulsa.

PAKISTAN INDUSTRIAL DEVELPMENT CORP.
Project: 1,000-mile system from Sui field to Lyallpur, Lahore, Daudkhel, Islamabad, Rawalpindi, and Wah. This would require a loop to an existing 310-mile 16-in. line from the Pakistan petroleum field to Multan.
Status: Proposed.

PAKISTAN PETROLEUM CO.
Project: 145 miles of 8-in. from Sylhet field to Daccq, East Pakistan.
Status: Proposed.

PETROLEOS MEXICANOS, Avenida Juarez 92-94, Mexico City, Mexico.
Project: A 500-mile extension of existing Ciudad Pemex-Mexico City line to Queretaro, Salamanca, San Luis Potosi, and Guadalajara.
Status: Planned.
Project: 270 miles of 12-in. from Torreon to Chihuahua.
Status: Under way.
Completion: September 1961.
Project: For proposed Texas to California line through Mexico, see Tennessee Gas listing below.

SOC. SICILIANI METANDOTTI (SOSIM). Partners include Edison Power, Italcementi, Fiat Motor, Sicilian SGES Power, Bombrini Parodi Delfino Chemical, and Montecatini.
Project: 560 miles from Hassi R'Mel gas field, Algeria, to Cape Bon, Tunisia, 77 miles across the Sicilian Channel, into northern Italy and beyond.
Status: Engineering studies under way.

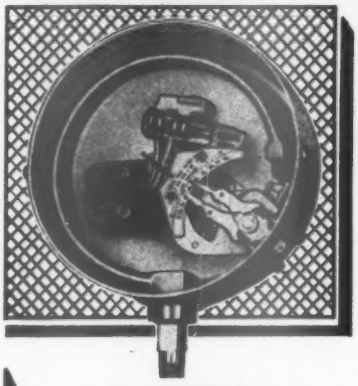
STANDARD-VACUUM OIL CO., New York.
Project: 60 miles of 8-in. from Radja field to Palembang, Sumatra, to supply fertilizer plant planned by the government.
Status: Planned.

TEIKOKU OIL CO. and **TOKYO GAS CO.**
Project: 200-mile, 12-in. system from Kubiki gas field.
Status: Proposed.

YACIMIENTOS PETROLIFEROS FISCALES (Argentina), Buenos Aires.
Project: 1,050-mile line from Comodoro Rivadavia to Buenos Aires with a spur to Plaza Huincul field in Neuquen Province. Line will be 26 in. to Plaza Huincul and 30 in. to Buenos Aires.
Status: Proposed.

316 STAINLESS STEEL

Welded Bourdon Tube and Pressure Connection



A NEW ADDITION to MERCOID PRESSURE CONTROLS

Series D-41, 243, 541

316 stainless steel welded Bourdon tube. ¼" (316) stainless steel pressure connection. Nickel plated mechanism. Outside adjustments. Calibrated dial. Hermetically sealed mercury contact.

Operating ranges: 30" vac.-75 psig; 10-100 psig; 30-400 psig; 75-800 psig. and 100-1000 psig.— with varying differentials and electrical capacity to meet your application.

Three case styles: General Purpose NEMA 1; Weather-Proof NEMA 1A, 2, 3, 4; Explosion-Proof Class 1 Group C, & D; Class 2 Group E, F, G, NEMA 7, 9, 9A.

WRITE FOR BULLETIN 619

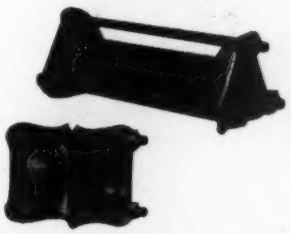
THE MERCOID CORPORATION
4211 Belmont Ave., Chicago 41, Ill.

Wherever oil flows... There's a Dresser® quality piping product that's right for the job

FOR GROOVED END PIPE

Dresser "KUPL + LOK" (TM) Couplings and Fittings, 500# & 1000# types.

FOR PLAIN-END PIPE



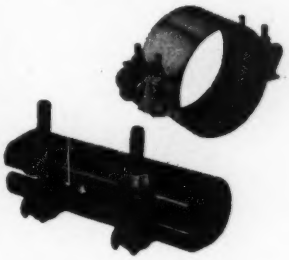
Style 40 Long Sleeves for spanning gaps between pipe ends.

Style 38 Couplings for regular applications.

FOR SMALL DIAMETER PIPE

Dresser Compression Couplings and Fittings . . . Sizes thru 2".

FOR PIPE REPAIRS



"360" Clamp for Asbestos-Cement Pipe "Handiband" Clamp for Steel Pipe

All the pipe joints you need for fast installation on tank batteries, gathering lines, mud pumps, salt-water disposal lines . . . now in stock at your supply store.

All the easy-to-install, permanent repair products that enable you to stop leaks fast . . . now in stock at your supply store.

Insist on Dresser quality when you buy pipe couplings, fittings and repair products. Every Dresser product is clearly marked . . . your guarantee of highest quality.

Bradford, Pennsylvania
Chicago
Houston
New York
S. San Francisco
Toronto & Calgary

DRESSER MANUFACTURING DIVISION

ONE OF THE DRESSER INDUSTRIES

Exclusive LUFKIN Chrome Clad® lines won't rust, chip or peel

The bold, black markings are bonded to steel . . . protected by layer on layer of electroplating . . . topped by a final coat of chromium!

Exclusive quality features are yours in all Lufkin tapes. For example:

Lufkin "Atlas" Gaging Tape (above, left) is easy to read with durable, jet-black markings on glare-free, chrome-white line. Extra *sturdy* line, 50% heavier than standard weight. 20-ounce plumb bob. Lock-handle frame.

Lufkin Chrome Clad Anchor Tape (above, right) is available with easy-to-read markings in feet, tenths and hundredths, in genuine-leather, hand-stitched case. The handiest thing you can carry, on job after job.

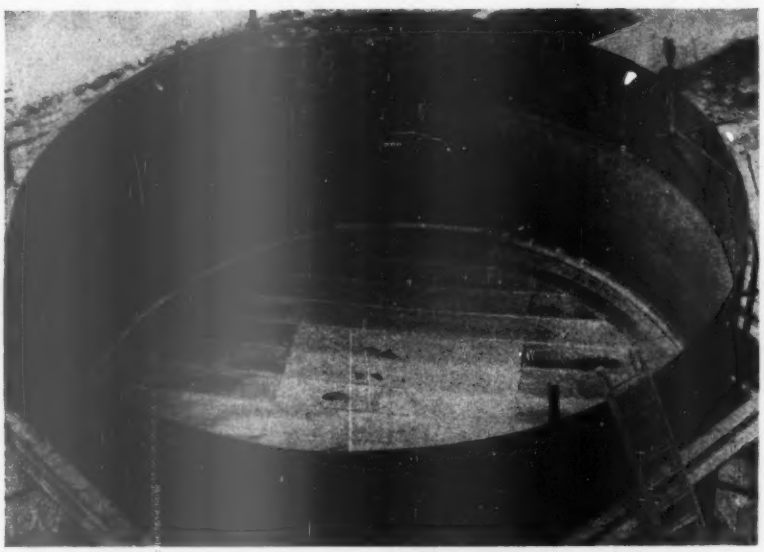
See your Oil Supply House.

Measure for measure, the finest made . . .

LUFKIN

SAGINAW, MICHIGAN

What's NEW . . . in equipment



Need more facts on the items described on these pages?

The manufacturers will gladly supply them. They're shown in bold type, with their addresses. For convenience, send this coupon to the manufacturer.

ITEM _____

_____

OIL and GAS JOURNAL
June 26, 1961

NAME _____

TITLE _____

COMPANY _____

ADDRESS _____

CITY _____

STATE _____

Aluminum internal floating deck for tanks promises to cut losses due to evaporation

EXPENSIVE FILLING and breathing losses from petroleum storage tanks may be reduced as much as 80 to 94% with an aluminum floating deck developed in France, called an Aludeck. The device is made of a peripheral angle onto which is fixed a member framework of special sections consisting of main beams with spacers at right angles. The internal floating deck itself consists of a paneled assembly made of aluminum elements. The aluminum panels are assembled by bolting with a seal to provide gas tightness. Self-supporting posts fixed beneath the internal floating deck keep it above the intake pipe.

Vapor is trapped under the deck. The seal is Z-shaped and made of glass fiber coated with polyester resin. According to the maker, the floating deck provides effective protection against fire hazards by limiting the extension of fire and making extinction easier. It is constructed with a bonding which enables electric charges to be led away. No special tools or skilled labor are needed to erect the floating deck. Source: **Laroche Bouvier & Cie.,** 5 Boulevard Edgar-Quinet, Colombes (Seine), France.

Casing size easily measured

With a handy oil well casing gage just brought out, you can accurately measure the size and gage the weight of casing per foot, for casing sizes from 5½ through 13⅜ in. o.d.

Compact and easy to carry, its gagings can be read at a glance. It is made of brass and stainless steel to prevent rusting, and the ends are hardened for durability. A shank extension is used for measuring casing sizes from 10¾ through 13⅜ in. Source: **Wm. L. Riggs Co.,** 600 S. 129th East Ave., Tulsa, Okla., U.S.A.

Two new pipe-wrap tapes

Temperatures up to 300° F. can be met by a new high-temperature pipe-wrap tape now available manufactured by a butyl-plastic lamination method with Mylar plastic serving as the protective outer cover. A companion product has been developed for yard applications. It is a rigid vinyl-butyl tape that does not require an overwrap for protection during transport from the yard to the location or for normal backfill conditions, the maker says.

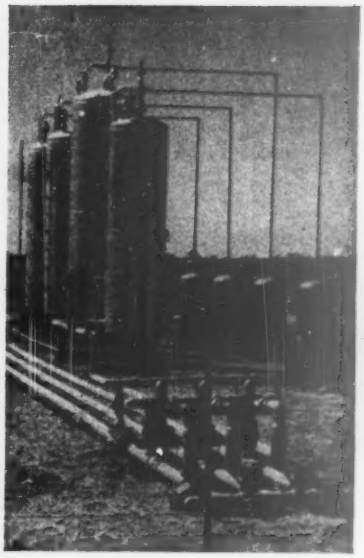
For both tapes, a liquid primer is used to form a positive bond between the pipe and the wrap to exclude moisture and chemicals. Source: **Plicoflex, Inc.,** P. O. Box 45911, Houston 45, Tex., U.S.A.

New fitting speeds pipe makeup

By eliminating the need for a coupling and an extra connection, a new pipe fitting now on the market offers a way to reduce pipe makeup time as compared with older types of fittings. And it can reduce the welding needed where seal welds are required.

Called a SAC (Save a Connection) fitting, it is made of Extra-Heavy Schedule 80, A106 Grade B pipe and normalized after forging. The large end is

METROL®
"CV" VOL-U-METERS®



METROL Model 10-CV-01 Vol-U-Meters metering and commingling oil from four separate royalty interests into a common tank battery.

METROL 10-CV-01 Vol-U-Meters metering and commingling oil from seven dual completed wells into a common tank battery.

METROL® "CV" VOL-U-METERS® are designed for accurate metering of crude oil and water by cycle accumulation, isolation and discharge of equal volumes.

METROL "CV" VOL-U-METERS are available in standard sizes, ¼, ½, 1, 2, 5, 10, 20 and 30 barrels per dump. Standard working pressures are 125, 300, 600 and 1200 psi. Capacities are shown in table below.

Metering accuracy of METROL "CV" VOL-U-METERS depends on proper liquid level control and proper valving, both of which are obtained and maintained. Accuracies of 99.99% are common. This accuracy is attributed to the vessel's patented snap-acting pilot mechanism*. Pilots used on VOL-U-METERS are reliably accurate and react at exact preset upper and lower levels. VOL-U-METERS are approved by most regulatory bodies for measuring oil for royalty and tax payments, testing wells, and commingling oil.

Average repair parts cost for METROL "CV" VOL-U-METERS is less than $5.00 per unit per year! Ruggedness and simplicity of these units, added to their high accuracy and dependability, make them the best meter for metering crude oil upstream of lease storage tanks.

Accurate metered volumes, low maintenance cost, trouble-free operation, efficient and accurate handling of production, increased field safety, and additional lease automation are among advantages provided by METROL "CV" VOL-U-METERS.

UNIT MODEL NO.	2½ CV	5 CV	10 CV	20 CV	50 CV	100 CV	200 CV	300 CV
Volume per dump, Bbl.	¼	½	1.0	2.0	5.0	10.0	20.0	30.0
Metering Capacity BPD								
Rated	300	500	720	1,440	2,000	4,000	8,000	15,000
Maximum	500	650	1,200	1,800	3,000	5,000	12,000	20,000
Avg. Expected Metering Accuracy, Percent	99.80	99.90	99.95	99.97	99.98	99.99	99.99	99.99

*U. S. Patent No. 2,818,738

® Trade Mark Registered U. S. Patent Office

We solicit your inquiries.

Every Unit is completely assembled, pressure tested, calibrated, and performance tested prior to shipment.

Competent Sales and Service Representatives located in all major oil areas.

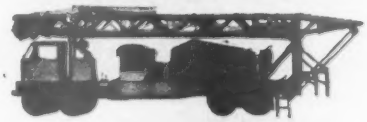
OIL METERING and Processing EQUIPMENT CORP.

MELROSE 5-1226 • 4841 YALE STREET
HOUSTON 18, TEXAS

P. O. Box 10777, Houston 18, Texas

Before You Make Any Deal

Get the facts about WINCHMOBILE JR.

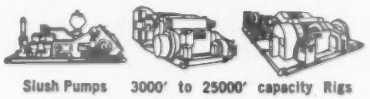


Wilson

Before you buy get the facts on light weight . . . low cost . . . long life Winchmobile Junior with the cross mounted engine which saves moving parts and increases hp to the drum by 15%!

WILSON MFG. CO., INC.
Wichita Falls, Texas • The Home of RED IRON

Winchmobiles Traveling Blocks Speedwinches



Slush Pumps 3000' to 25000' capacity Rigs

SNAP-ON

SUCKER ROD

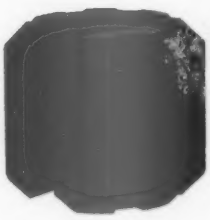
GUIDES

Made of oil-resistant synthetic rubber or Nylon* are saving producers thousands of dollars by:

- Increasing Rod & Tubing Life
- Lowering Polish Rod Loads
- Saving Coupling Wear
- Dampening Vibration
- Reducing Friction
- Cutting Operating Costs

*Nylon guides are for use in sour crude

SNAP-ON SUCKER ROD GUIDE



FLUTED TUBING STABILIZER

WRITE FOR COMPLETE INFORMATION ON SIZES, PRICES AND INSTALLATION PROCEDURES.

ASK FOR

BULLETIN NO. 8160

"OIL FIELD RUBBER PRODUCTS OF MATCHLESS QUALITY"

Oil States

OIL STATES RUBBER CO.

DRAWER 152

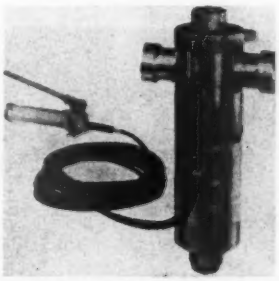
ARLINGTON, TEXAS

OSR-22

male-threaded and may be either beveled or square cut. The small end may be either female-threaded or prepared for socked welding with the outside diameter of the socket-weld end the same as that of an API coupling.

Made with the same end-to-end dimensions as swaged nipples, the fitting is stocked in sizes from ½-by-½ to 2-by-1½ in. Larger sizes are available on special order. Source: **Exner-Dodge Inc.,** Box 565, Coffeyville, Kans., U.S.A.

•

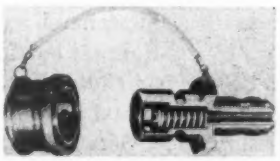


Newest hydraulic type of wire line stripper

Field tests on a new hydraulic wire-line stripper used in swabbing operations by several drilling contractors indicated that the unit was highly efficient as an oil saver and that it showed a minimum of wear, according to the manufacturer. Features of the HAR unit include an automatic release mechanism which is said to add to its safety and time-saving features.

The oil saver uses a hydraulic pump to activate pressure in the stripper. Activation is accomplished with two or three strokes of the hydraulic lever at platform level. Source: **King Oil Tools,** Box 15146, Houston 20, Tex., U.S.A.

•



Pressure adapter with cap assembly permits fast disconnections

An oil-servicing pressure adapter made of stainless steel with a quick-disconnect cap assembly is available. The unit is designed so that, when the cap assembly is removed,

Sandban Screen

new protection against sand production

Here is a cutaway section of Sandban* screen – a Dowell product that is designed to hold back unconsolidated sand while allowing normal production of well fluids. Notice the porous network of plastic-coated walnut shells supported inside and out by a slotted pipe.

Operators have reported success with Dowell-developed Sandban screen where all other attempts at sand control had failed.

Formation cleaning chemicals – even Super Mud Acid – can be used with Sandban screen in place. Ask your Dowell representative for full information. *DOWELL TRADEMARK

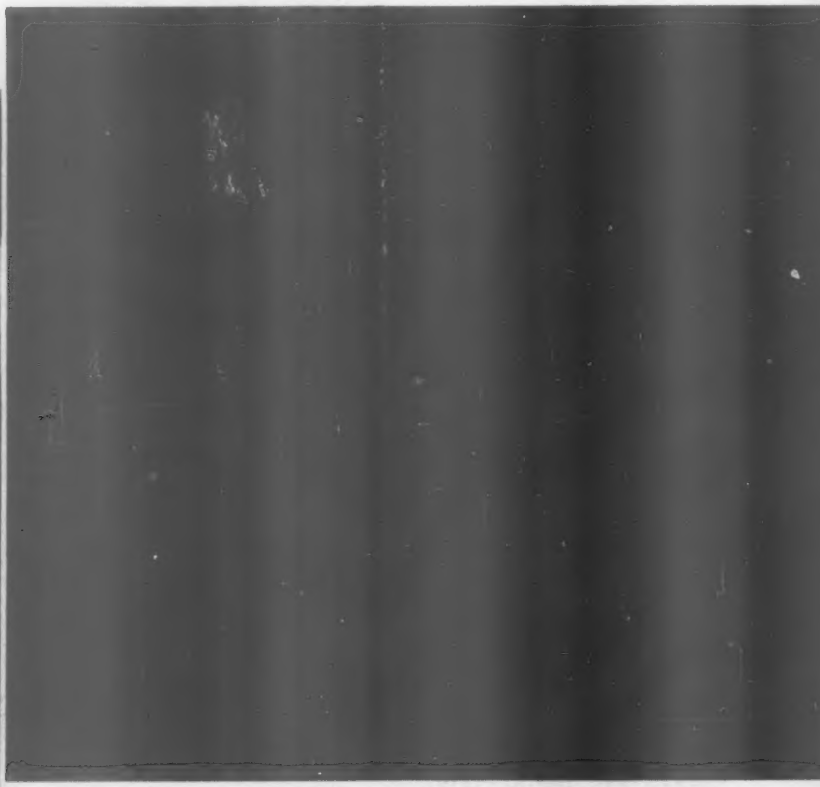
PRODUCTS FOR THE OIL INDUSTRY

DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

put them all together

they spell higher pumping efficiency even when worn



The Mud Monarch® for high pressures lasts longer and does a better job to the very end. The important thing to remember about the Mud Monarch valves and seats is the exclusive seal ring. This seal ring is unaffected by wear on both valve and seat. There is no fluid slippage, no imperfect closing due to sand or foreign material. For low and medium pressure pumps, Mission Super-Service® and Silver Top® valves will last longest. Their heavy forged alloy steel bodies have high corrosion fatigue strength and are able to resist cyclic stresses set up by loading and unloading. The Compound 308® inserts offer greatest resistance to the chemical and abrasive effect of the fluid. For any pressure, any pump, Mission pump parts are the industry's first choice for longer life, less trouble.

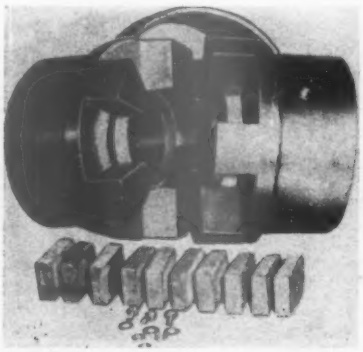
MISSION MANUFACTURING CO.

MISSION MANUFACTURING CO. P. O. Box 4209, Houston, Texas Cable Address "MISSCO" Export Office: 30 Rockefeller Plaza, New York
In the United Kingdom: MISSION MANUFACTURING CO., LTD., 1 Hanover Square, London W. 1 England • cable address "MISSOMAN"

a nozzle connection can be attached to the adapter that will depress the poppet valve and permit oil flow under pressure. When the nozzle is removed by quick-disconnect, a spring returns the valve to its closed position immediately, shutting off oil flow and preventing leakage.

The body of the adapter is a one-piece housing spun over the poppet valve and spring. A rubber O-ring is seated at the end of the poppet to prevent leaks. A groove running around the body of the adapter permits a quick-disconnect seat for the retaining balls in the cap, which are cammed into locked position by the outer sleeve of the cap assembly. Source: **Dumont Engineering Co.,** 1401 Freeman Ave., Long Beach, Calif., U.S.A.

•



Flexible coupling is used in water, oil, or chemicals

When it's necessary to transmit power through a shaft which must be submerged in fluid, a new flexible coupling may offer a solution. The coupling is designed to run under water for at least 3 years without maintenance, the maker reports. It will also operate in oil, mild chemicals, and corrosives.

The coupling body is made of semisteel castings. Both the outside collar and the inside sleeves are hot-dipped galvanized. The set screws, lock washers, and retaining bolts are made of stainless steel. The cushions are fabricated from bakelite and boiled in water for 5 days to prevent swelling, shrinking, or other distortion after they are installed.

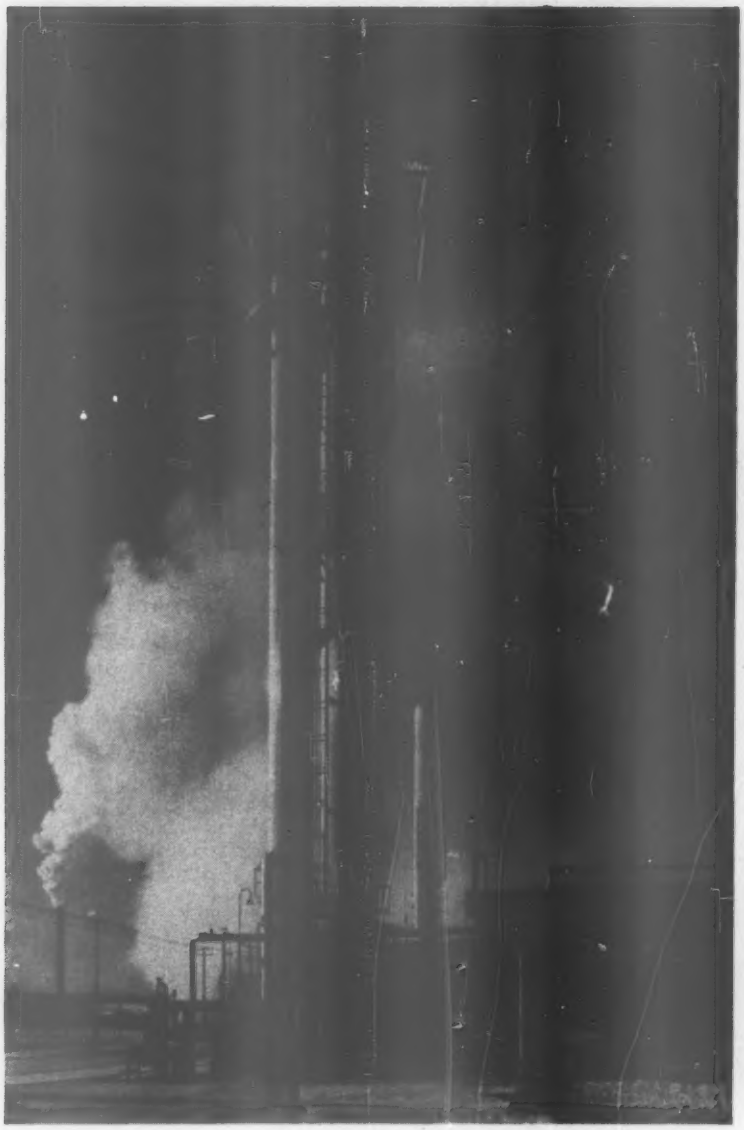
You can get the coupling in ratings from 2.6 to 1,365 hp. at 100 r.p.m. with bore sizes from solid to 9½ in. Source: **Lovejoy Flexible Coupling Co.,** 4921 W. Lake, Chicago 44, Ill., U.S.A.

NEW BARTON 273 PNEUMATIC TRANSMITTER MEETS MORE APPLICATION REQUIREMENTS THAN ANY OTHER TRANSMITTER

The Barton 273 offers the widest differential pressure ranges (0-8″ w.c. to 0-400 psi), the highest safe working pressures (to 10,000 psi), and the widest variety of housing materials (aluminum, brass, steel, 316 stainless steel). It's compact, weighing up to less than ½ the weight of other units. It has adjustable suppression up to 80% of DP range, and adjustable span. A non-bleed relay minimizes air consumption. It doesn't shift zero on overrange. It's unaffected by normal piping stress. In every respect, the Barton 273 is the most significant advance in pneumatic transmitters in the past decade. There's a lot more you should know about it—for complete data write

BARTON

INSTRUMENT CORPORATION, 580 MONTEREY PASS ROAD, MONTEREY PARK, CALIFORNIA.



Towers for Texaco

When it comes to producing vessels of this kind, experience on the part of the fabricator is a great asset to the main contractor. To have a fully equipped plant is not enough. There must also be a very advanced knowledge of the actual techniques of steel fabrication. New materials and procedures are always being developed and to reap the benefits, they have to be properly applied.

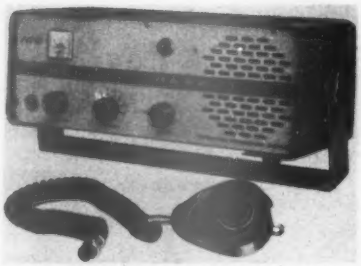
These towers were fabricated by the Platework Division of Dominion Bridge to designs supplied by Foster Wheeler and are typical of hundreds that Dominion Bridge has made for the oil and chemical process industries.

Dominion Bridge plants across the country are well experienced in this business and the sum total of this experience is applied to every new contract.

72

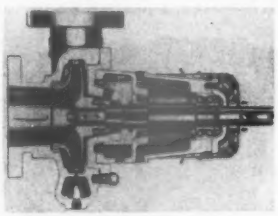
Platework by **DOMINION BRIDGE**

DOMINION BRIDGE COMPANY LIMITED - FIFTEEN PLANTS COAST-TO-COAST IN CANADA



Transmitter-receiver for citizens-band operation

Either a 115-volt a.c. power source or a 12-volt d.c. battery can be used to operate a new eight-channel radio telephone designed for use on the citizens band frequencies. Features of the Mercury Mark 1 unit include a high-gain, all-tube superheterodyne receiver with any combination of up to eight crystal-controlled spot frequencies for Channels 1 to 22, as required, and a built-in 4-in. dynamic speaker. The output meter and controls are front-panel mounted with a combined on-off and volume, adjustable squelch control, and eight-channel selector switch. Source: **International Communications Corp.,** 1929 Wilshire Blvd., Santa Monica, Calif., U.S.A.



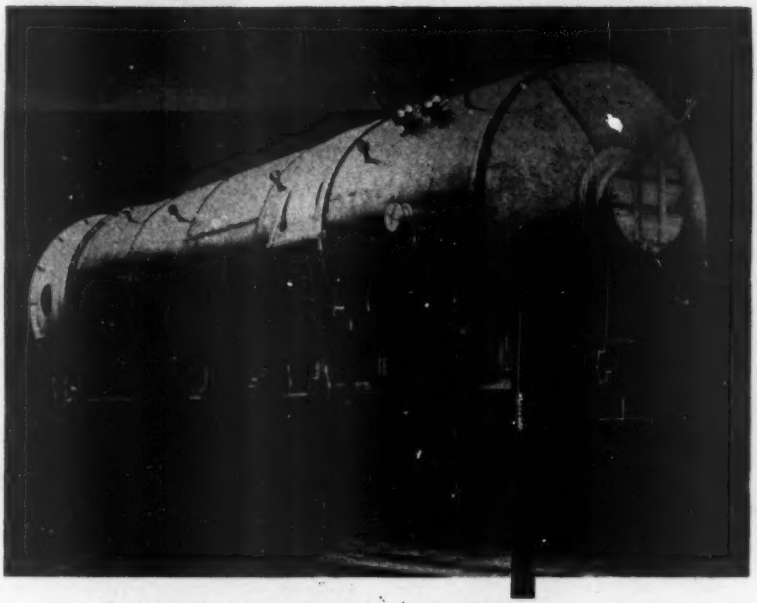
Pump features interchangeability

From two basic pump styles, up to 72 basic combinations are possible with the Models SMJ and SMJI process pumps now on the market. In plants with a number of different pump applications, this can mean simplification in stocking of spare parts. By interchanging the impellers, covers, nozzle arrangements, bearing construction, cooling methods, and other components, the requirements of almost any service can be met from off-the-shelf parts.

Design features of the pump include an air-cooled bearing housing. Using a special built-in fan cooling system, the pump needs no cooling water for the bearings in many applications. The pump

from ALCOA

good designs made better with aluminum



Corrosive process in southern chemical plant requires 50-ft aluminum tray tower built by Graver

Look for ALCOA® Aluminum when there's a highly corrosive process to be controlled. Example: this aluminum absorber column is used in the conversion of natural gas to hydrogen cyanide. Built by Graver Tank & Mfg. Co., a division of Union Tank Car Co., the column has an outer diameter of 10½ ft and height of 50 ft. Here again, function, low cost and ease of maintenance indicate a design with aluminum. In so many chemical and process operations, there's no practical substitute for aluminum. For more information, please send the coupon.

ALCOA ALUMINUM
ALUMINUM COMPANY OF AMERICA

Aluminum Company of America, 826-A Alcoa Building, Pittsburgh 19, Pa.
Please send me the following literature covering Alcoa Aluminum for tubular products and other uses in the process industries.

- ☐ 34-10197 Aluminum Pipe and Fittings
- ☐ 34-10418 Alcoa Unitrace: Combines Piping and Tracing in One Unit
- ☐ 68-10460 Process Industries Applications of Alcoa Aluminum
- ☐ 42-20849 Resistance of Aluminum Alloys to Weathering and Resistance of Aluminum Alloys to Chemically Contaminated Atmospheres
- ☐ 88-11453 Solving Refinery Corrosion Problems with Aluminum

Name_____ Title_____
Company_____
Address_____
City_____ Zone_____ State_____

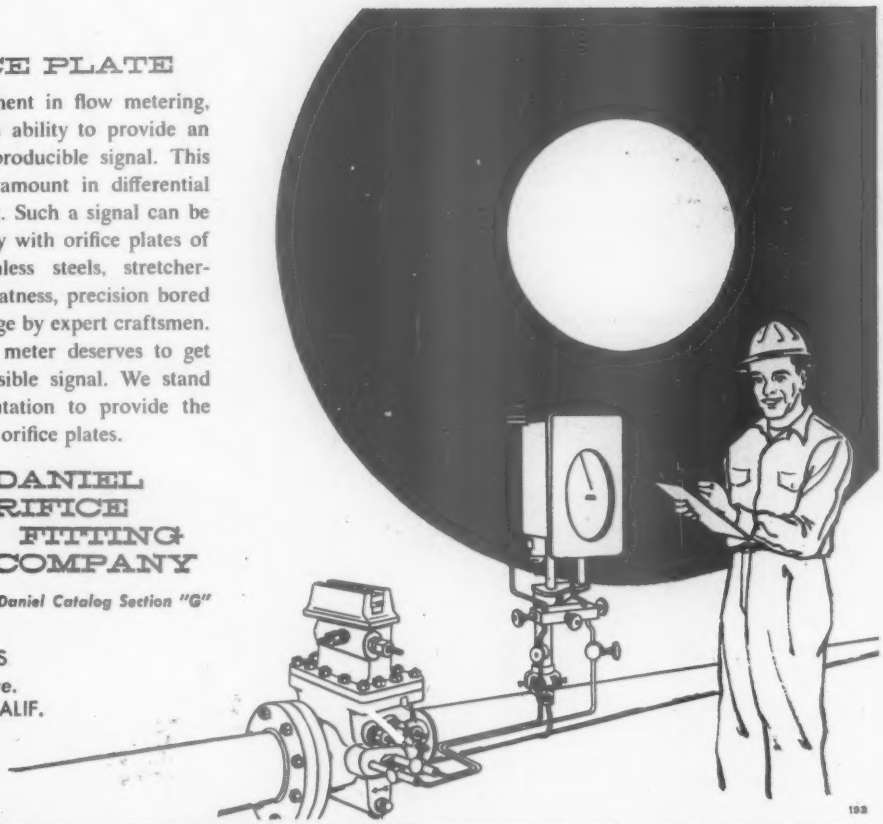
THE ORIFICE PLATE

primary element in flow metering, stands on its ability to provide an accurate, reproducible signal. This signal is paramount in differential measurement. Such a signal can be achieved only with orifice plates of quality stainless steels, stretcher-leveled for flatness, precision bored to a knife-edge by expert craftsmen. Your orifice meter deserves to get the best possible signal. We stand on our reputation to provide the best possible orifice plates.

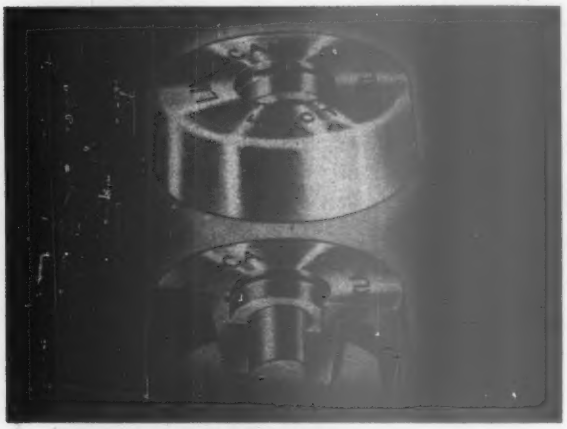
DANIEL ORIFICE FITTING COMPANY

Orifice Plates—Daniel Catalog Section "G"

- 9720 Katy Road
  HOUSTON 24, TEXAS
- 3352 Union Pacific Ave.
  LOS ANGELES 23, CALIF.
- ODESSA
- DALLAS
- CORPUS CHRISTI
- TULSA
- NEW ORLEANS



193



DEEP RECESSED!...

Line Scale's complete line of valves and seats incorporates a deep recessed valve lift retainer. Special design eliminates piling of coil and prevents valve over-travel. This feature, combined with other advantages, makes Line Scale the outstanding manufacturer of valve and seats.

Line Scale valves and seats are available for all reciprocating pumps, regardless of size, age or model. For prices, specifications, and further information, write to:

Line Scale

Little Giant Corporation
3810 N. Tulsa, Oklahoma City

TO THE EXECUTIVE WITH TROUBLESOME MANAGEMENT PROBLEMS

in six pocket-size volumes

THE EXECUTIVE MANAGEMENT SERIES

(de luxe edition)

Here are six powerful Executive Management Techniques:

- *Four Keys to Able Management*
- *Time Out for Mental Digestion*
- *The Specification Technique of Management*
- *The Executive as a Human Chemist*
- *Obvious Adams*
- *Tested Techniques for Developing and Selling your Ideas.*

Topmost management men authored these outstanding brochures—one is consultant for many great corporations.

All you need is 30 minutes a day. Before you know it, you've discovered clear-cut management concepts which will be priceless to your effectiveness as a business leader. Typical users are:

Socony-Mobil Oil Co., Sinclair Refining Co., Cities Service Oil Co., Babcock & Wilcox Co., Monsanto Chemical Co.

It is seldom you'll find anything anywhere which will match the dominant techniques offered here. A former General Foods executive said, "In my opinion nothing else . . . surpasses this in practical utility to executives."

Clip coupon—mail it today!

THE OIL AND GAS JOURNAL, BOX 1260, TULSA 1, OKLAHOMA

Send EXECUTIVE MANAGEMENT SERIES in 6 volumes, de luxe edition. Enclosed $7.75 is prepaid price.

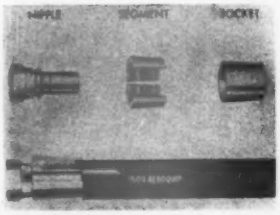
Name _____ *Title*

Company _____

Street _____ *City* _____ *Zone* _____ *State*

models come in capacities to 1,200 g.p.m., differential heads to 1,600 ft., pressures to 1,000 psi., and temperatures to 850° F. Source: **Byron Jackson Pumps, Inc.**, P. O. 2017, Terminal Annex, Los Angeles 54, Calif., U.S.A.

●

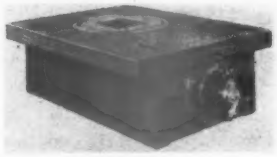


New fitting for high-pressure hose

Incorrect assembly is virtually impossible with a new detachable and reusable fitting now available for high-pressure hose assemblies, the maker claims. Suitable for heavy equipment, the fitting is recommended by the manufacturer for a wide range of high-pressure hydraulic and pneumatic applications and for fuel and lubrication systems.

Called an Iron Mike, the fitting is designed for use with the maker's Type 1509 multiple-wire-braid hose. It comes in 10 end-fitting styles for hose sizes from ¾ to 2 in. Source: **Aeroquip Corp.**, 300 S. East Ave., Jackson, Mich., U.S.A.

●



Rotary table for deep drilling

Equipped with a 27½-in. table opening and a 450-ton static-load rating, a new rotary machine, Model B-275, is available for deep holes. Features include a unitized gear-table assembly for the main and holddown bearings that permits complete adjustment of the bearings before installation of the table assembly in the housing. To permit accurate and permanent alignment of the bearings and to provide for easy servicing, the designer has en-

from ALCOA

good designs made better with aluminum

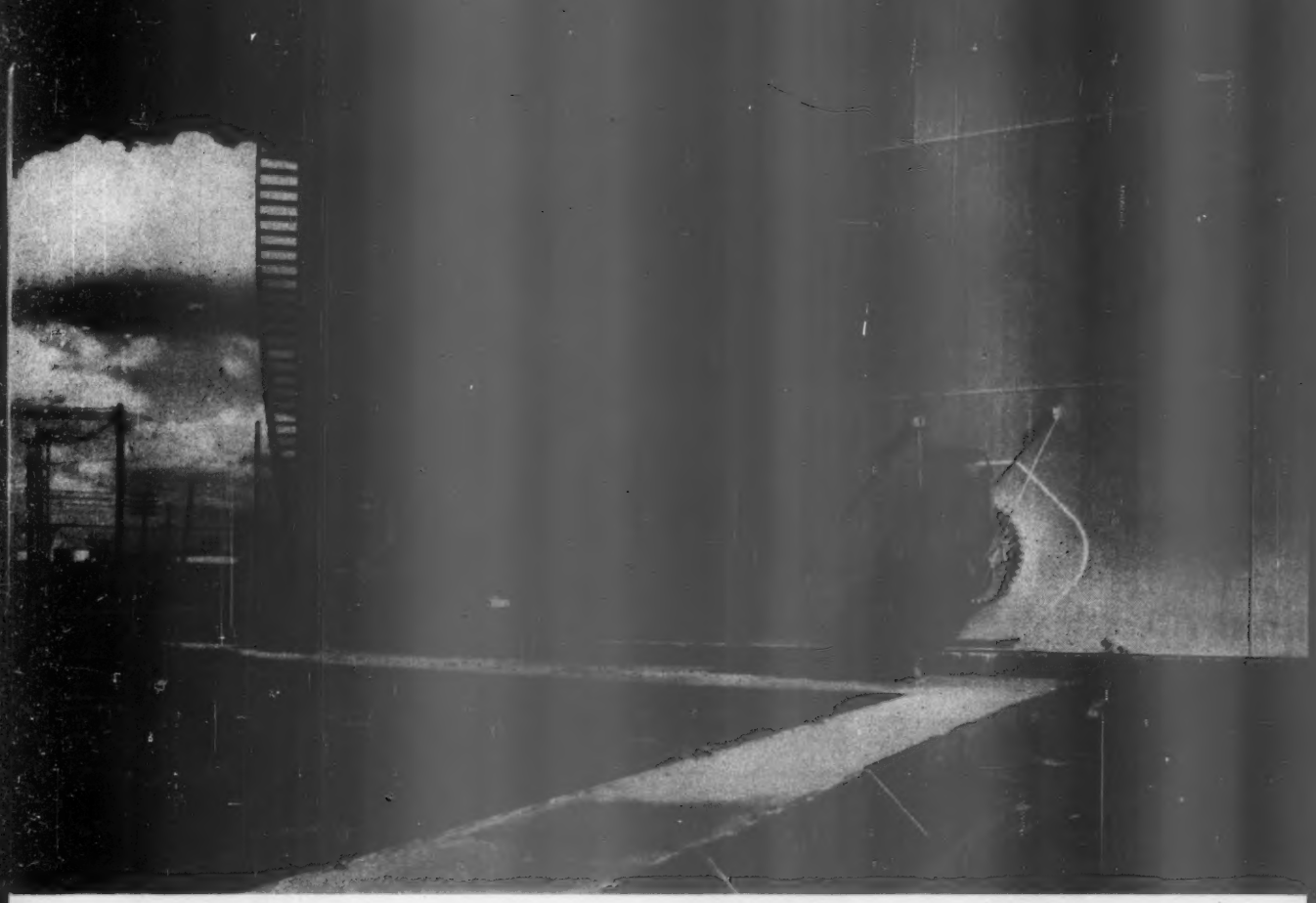
Aluminum cooling system at Oak Ridge includes Tube-Turn fittings

At Oak Ridge National Laboratory, a cooling system utilizing aluminum forces more than 12,000 gal of water per minute through the research reactor. Welding fittings up to 24 in., thought to be the world's largest of aluminum, were made with Alcoa® Aluminum by Tube Turns Division of Chemetron Corporation, Louisville, Ky. Aluminum was selected to maintain purity of the demineralized water. Other advantages: aluminum's low cost, corrosion resistance and superior heat-transfer ability. To take advantage of Alcoa's 35 years of heat exchanger experience, please send the coupon.

ALCOA ALUMINUM
ALUMINUM COMPANY OF AMERICA

Aluminum Company of America, 826-AA Alcoa Building, Pittsburgh 19, Pa.
Please send me the following literature:
☐ 34-10197 *Aluminum Pipe and Fittings*
☐ 68-10460 *Process Industries Applications of Alcoa Aluminum*
☐ 34-11566 *Alcoa Aluminum Heat Exchangers and Condensers*

Name_____ Title_____
Company_____
Address_____
City_____ Zone_____ State_____



How they keep crude from stacking up like pancakes

Surging into this tank come crudes from wells scattered over 23 counties.

Out of the tank comes *one* crude, at the right gravity to feed to refineries more than 450 miles away.

For the men who run the tank farm, it's no chore at all to blend 122,000 barrels of crudes ranging from less than 20° to above 85° in gravity. They do it by flipping three switches.

The LIGHTNIN Mixers you see here do the rest. While the tank is filling, and for two or three hours before it goes on suction, the mixers create a powerful, steady turnover that breaks up stratification from the bottom up. The outgoing tender of crude stays within a degree or two of constant gravity.

Control BS&W, too. That's not all. These mixers help keep sludge from settling on the tank bottom and stealing valuable storage space. They keep the tank working at its full capacity.

Multiply these savings by the number of tanks at this farm equipped with LIGHTNIN Mixers—and you can see why more than 50 pipeline companies and 35 leading oil companies use this easy way to keep operating costs in line.

How about you? If you'd like to see how LIGHTNIN Mixers on your big tanks can save you as much as $1000 per tank per year, call in your LIGHTNIN representative. He's listed in Composite Catalog. Or write us today.

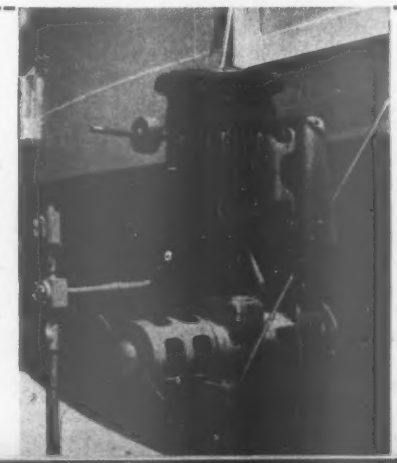
YOU CAN ADD as much as 12% extra storage capacity to your tank farm—by using LIGHTNIN Mixers to keep tanks free of space-eating sludge. Mixing results are unconditionally guaranteed.

Lightnin' Mixers

MIXCO fluid mixing specialists

Get these helpful bulletins on BS&W control and LIGHTNIN Mixers. Check, tear out and mail to us today with your name and company address. Free—no obligation.

- ☐ BS&W Control with LIGHTNIN Mixers (B-503)
- ☐ Side-entering mixers, 1 to 25 hp (B-104)
- ☐ Data sheet for figuring mixer requirements (B-107)
- ☐ Condensed catalog describing LIGHTNIN Mixers—all types (B-109)
- ☐ LIGHTNIN rotary mechanical seals to eliminate stuffing-box maintenance (B-111)



MIXING EQUIPMENT CO., INC. 174-f Mt. Read Blvd., Rochester 3, N. Y.

In Canada: Greey Mixing Equipment, Ltd., 100 Miranda Ave., Toronto 19, Ont.

In Europe: Lightnin Mixers, Ltd., Poynton, Cheshire, England

closed the pinion shaft and bearings in a cylindrical housing.

The unit is oil lubricated. A triple tongue-and-groove labyrinth between the gear and housing keeps oil in and prevents entrance of mud at the top of the gear table enclosure. Source: **National Supply Div., Armco Steel Corp.,** 2 Gateway Center, Pittsburgh 22, Pa., U.S.A.

●

Rectifier is checked fast

Checking time can be speeded and accuracy increased with a cathodic protection rectifier now available that's equipped with a 4-in. meter scale which reads in amperes or volts. The switching circuit features single-switch operation and lightning-damage protection. It is color-keyed to the switch with a red scale that reads amperes and a lower, blue scale, that reads volts. Source: **Good-All Electric Mfg. Co.,** Good-All Bldg., Ogallala, Neb., U.S.A.

●

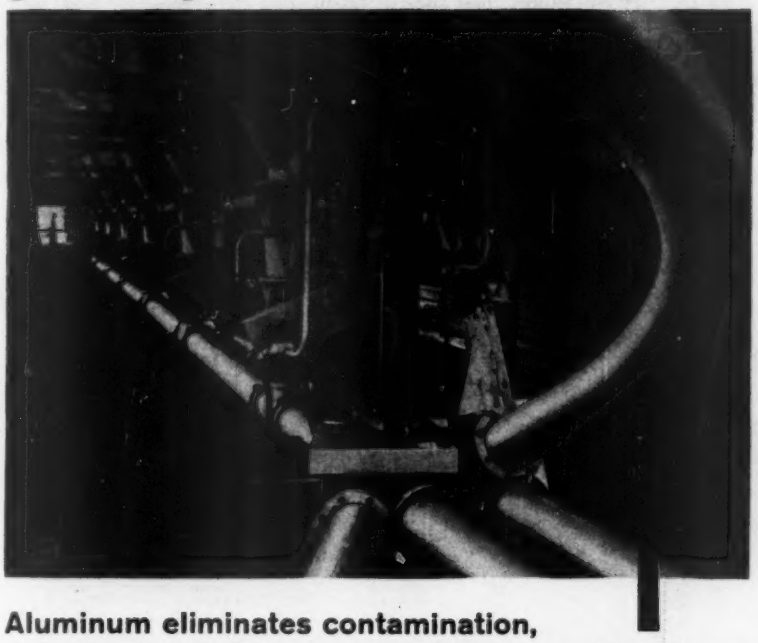
Portable digital tape recorder

Numbers set into the dials on a new portable digital tape recorder are converted to a magnetic recording on ¼-in. tape by a stroke of the recording lever. Called a Metercorder, the instrument was developed specially to be used in domestic meter reading. However, it has numerous other potential uses where there is a need to tabulate data.

Weighing only 2½ lb., the recorder is powered by a 1½-volt penlight battery. It is said to be completely weatherproof and can be operated in a hard rain. Source: **UGC Instruments,** P. O. Box 1407, Shreveport, La., U.S.A.

from ALCOA

good designs made better with aluminum



Aluminum eliminates contamination, withstands low temperatures without embrittlement in southwestern polypropylene plant

To prevent product discoloration, this polypropylene process employs ALCOA® Aluminum—in piping, bins, hoppers and vessels. Also, aluminum's excellent low-temperature durability is an important asset; tensile and yield strengths actually increase without embrittlement as operating temperatures drop.

Aluminum is nontoxic, has a higher strength-weight ratio than most metals, costs less to install than any other suitable material. We'd like to send you more information. Please send the coupon.

ALCOA ALUMINUM
ALUMINUM COMPANY OF AMERICA

Aluminum Company of America, 826-N Alcoa Building, Pittsburgh 19, Pa.

Please send me the following literature covering Alcoa Aluminum for tubular products and other uses in the process industries.

☐ 34-10197 *Aluminum Pipe and Fittings*
☐ 34-10418 *Alcoa Unitrace: Combines Piping and Tracing in One Unit*
☐ 88-11251 *Cryogenic Applications of Alcoa Aluminum*
☐ 68-10460 *Process Industries Applications of Alcoa Aluminum*

Name_____ Title_____

Company_____

Address_____

City_____ Zone_____ State_____

What's NEW

... in literature

Semi-steel valves and accessories

Specifications and dimensions are given in revised bulletin V-203 for all sizes of semi-steel straightway, steam jacketed, multiport, and special-order valves. Accessories described include wrenches, locking devices, extensions, lubricants, and the new Hypregun for lubricating valves. Source: **Nordstrom Valve Div., Rockwell Mfg. Co.,** 390 N. Lexington Ave., Pittsburgh 8, Pa., U.S.A.

Polished rods, rod liners, and sucker-rod couplings

Designed for hard pumping and for wells where repair costs are frequent due to excessive rod and tubing wear, these rods, liners, and couplings — called "Tuffy" — come with a hard bearing surface which cuts down wear caused by metal-to-metal friction. Called "Thermospray," the hard metal is a special alloy powder of finely divided boride and carbide particles in a nickel matrix that is heated and sprayed onto the steel. It's then fused with the base material under high temperature. The four-page literature describes and illustrates special advantages obtained with the Thermospray process, and also contains data as to sizes and types of Tuffy equipment available. Source: **Harbison-Fischer Mfg. Co.,** Box 2477, Fort Worth, Tex., U.S.A.

... another Jones First
JONES
Rolled-Thread Undercut Pin
Greater Strength–Easier Make-Up
Rolled threads, made by cold working or displacing the metal into the thread form, are stronger at the very point where most cut-thread pin failures originate. Steel fibers and grain are rearranged to follow the thread contour, providing a dense structure at the critical thread root . . . added strength where it is needed most. Additional fatigue resistance is obtained by undercutting the pin shank, thereby eliminating the run-out thread and improving the elasticity of the joint. The superior finish and gauge tolerances attained in Jones rolled-thread sucker rod pins reduce friction and make possible greater prestressing of the joint with equal torque.
Ask your Jones representative for complete information on this new Jones development.
THE S. M. JONES COMPANY
Division of Buffalo Eclipse Corporation
General Office and Factory: TOLEDO, OHIO
Sales Office: Enterprise Building, TULSA, OKLAHOMA
Export Department: The S. M. Jones Company
140
SUCKER RODS

Trimethoxyboroxine chemical

Bulletin CT-520 concerns itself with applications of trimethoxyboroxine (TMB) as a metals fire extinguishant; and as an agent for nitrogen removal from refinery feed stocks. TMB has been found effective at 0.01 to 0.025 weight per cent in removing nitrogen containing contaminants and giving oil greater thermal stability and resistance to oxidation, according to the eight-page literature. Typical physical properties listed include vapor pressure at varying temperatures; solubility of organic liquids in TMB at 25° C.; and solubility of inorganic compounds in TMB. Source: **Callery Chemical Co.,** Callery, Pa., U.S.A.

Fixed-station antenna systems

This new-product brochure, just released, deals with base-station antenna equipment for two-way communication bands. In four pages it describes 23 antennas available from stock with suggested cable-installation kits, mounting clamps, and transmission lines. Source: **Andrew Corp.,** Box 807, Chicago 42, Ill., U.S.A.

Compressor-valves

The operation and importance of valves in modern reciprocating compressors are described in a new 44-page booklet — "Questions and Answers About Valving, the Heart of the Compressor." The booklet details the demands made on valves and their function in a compressor. It traces the evolution of valving from the mechanically operated intake valves and heavy poppet dis-

charge valves of the 19th century to modern high-speed, air-cushioned valves. Source: **Ingersoll-Rand Co.,** 11 Broadway, New York 14, N. Y., U.S.A.

Indicating-gage catalog

Helicoid pressure, vacuum, and compound-indicating gages are outlined in regard to construction features and operation. The catalog describes various types of cases, dials, and movements such as bronze, steel, stainless steel, and K Monel. Source: **Helicoid Gage Div., American Chain & Cable Co., Inc.,** 929 Connecticut Ave., Bridgeport 2, Conn., U.S.A.

Free pipe-dimension chart

This new 17 by 11-in. chart shows outside diameter and wall thickness for all sizes of pipe from ½ through 42 in. It includes information from ASA Standard B36.10, showing IPS and schedule numbers and their relationship, and includes latest wall thicknesses added in the 1959 revision. Source: **Midwest Piping Div., Crane Co.,** Box 433, St. Louis 66, Mo., U.S.A.

Engine cooling, waste-heat recovery systems

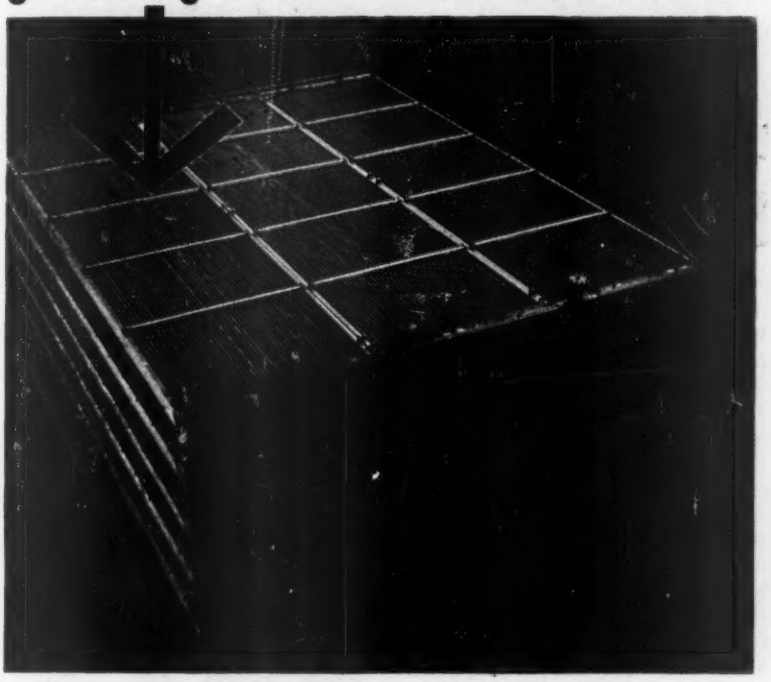
This two-page literature piece uses the case-history approach illustrating a system installed to cool and recover waste heat of jacket water and exhaust from four 714 b.hp. dual-fuel engines. Similar systems are applicable to oil-field gas engine-compressor stations, Kobe pumping plants, and oil-field generating plants for treating crude oil and for removal of carbon dioxide. Source: **Lloyd Harbert Co.,** Box 778, Santa Monica, Calif., U.S.A.

Data on line-mounted rotary gas meters

Called Rootsmeters, the models are offered in 3,000 and 7,000 c.f.m. (dial rate) for working pressures to 125 psi. The literature comes with a separate brochure which gives meter features and detailed specifications including construction data, dimensions, and capacity ratings at various operating pressures. Source: **Roots-Connersville Blower Div., Dresser Industries, Inc.,** Connersville, Ind., U.S.A.

from ALCOA

good designs made better with aluminum



Griscom-Russell designs and builds record heat exchanger with 525 miles of Alcoa Aluminum coiled sheet

World's largest single-cell fin-fan unit, this air-cooled heat exchanger (cut shows cooling sections only) was installed in a major European refinery. Designed and built by Griscom-Russell Co., Massillon, Ohio, it cools heavy hydrocarbon liquid over a 300°F range. Containing 525 miles of Alcoa® Aluminum coiled sheet, the unit has a total cooling surface of 267,000 sq ft. Advantages of aluminum: high thermal conductivity, corrosion resistance and low cost. For more information, please mail the coupon.

ALCOA ALUMINUM
ALUMINUM COMPANY OF AMERICA

Aluminum Company of America, 826-NN Alcoa Building, Pittsburgh 19, Pa.
Please send me the following literature:
☐ 68-10460 *Process Industries Applications of Alcoa Aluminum*
☐ 34-11566 *Alcoa Aluminum Heat Exchanger Tubes*

Name_____ Title_____
Company_____
Address_____
City_____ Zone_____ State_____

▶▶▶ Equipment Men Notes

Ralph M. Parsons Co. acquires ... Anaconda-Jurden Associates, Inc., New York City engineering and industrial design subsidiary of Anaconda Co. The announcement was made by Ralph Parsons, president of the Los Angeles engineering-construction firm. Offices of Parsons-Jurden Corp., which the newly acquired firm will be called, will remain in their present location. Parsons-Jurden will be operated as a subsidiary of Ralph M. Parsons Co.

Ralph Parsons

Wilbur Jurden

Wilbur Jurden, previously president of Anaconda-Jurden, will retain the same position with Parsons-Jurden Corp. Ralph M. Parsons will become the company's chairman of the board. Other officers are Milton Lewis, executive vice president; Harry P. Broom, vice president; and V. E. Bradford, vice president and treasurer.

While continuing to offer services to metals industries, activities of the Parsons-Jurden office will be broadened to include nuclear, missile, petroleum refinery, and chemical-plant engineering and construction.

Republic Supply Co. makes ... a number of new assignments of managerial personnel. C. J. Jump, assigned to the general office at Oklahoma City, will become West Texas district manager with headquarters at Midland. H. L. (Jelly) Ellis, manager in West Texas for 21 years, will become senior sales consultant.

Jerry Bergin, who has been district manager in South Louisiana, has been reassigned to the general office as manager of field operations. Clyde Wade, assistant district manager in South Louisiana, replaces Bergin as district manager with headquarters at New Orleans. J. E. Roberts, former sales office manager at Midland, is now district manager for Illinois with headquarters at Salem.

Jack Breen, sales representative at Dallas, has been assigned as manager of the New Orleans sales office. Dick Evans, sales representative at Wichita Falls, replaces Breen in Dallas. K. L. Maxwell, sales representative in Oklahoma City, has been assigned as district manager for South Texas with headquarters at Corpus Christi. George Wallis, formerly with U. S. Steel Corp., has joined Republic as controller and will be headquartered in Oklahoma City.

Swart, Marshall are appointed ... to new executive posts by Donald E. Graham, president of Smith Industries International, Inc. The changes result from expansion and will place administrative, sales, manufacturing, and engineering operations of the corporation's various divisions under centralized management.

K. H. Swart

A. S. Marshall

Kenneth H. Swart was named to the newly created post of executive vice president and general manager. He was formerly president of Smith Tool Co. Arthur S. Marshall became vice president in charge of sales. Other appointments include Manuel L. McAlister, vice president of manufacturing; Robert F. Evans, vice president of engineering; H. M. Nelly, Jr., vice president; and Harry E. Kidder, director of industrial relations. With the exception of Nelly, all held similar positions with Smith Tool Co.

Presently Smith Industries' divisions include Smith Tool Co., Smith Dynamics, Bufnel Co., Smith Forge Co., and Barrenas de Mexico.

Appleton Electric Co. appoints

... Phillips M. Darby to assistant vice president—general sales manager. Before this appointment he was general sales manager, a position he held since June 1959. Prior to that he was sales manager of the Appleton Unilet and Reelite Divisions. Darby started with Appleton in 1948 when he joined the Cleveland office as a field engineer.

Crane Co. announces assignment ... of E. Byron Stolle as general manager of its Midwest Piping Division, headquartered in St. Louis. He succeeds O. P. Carter, who has been assigned special duties with the parent company. Stolle joined Midwest Piping as a draftsman in 1937 and worked in various engineering capacities. In 1958 he became vice president and manager of Midwest's Pacific Division in Los Angeles.

E. B. Stolle

Herbert W. Taylor to manage ... the resin sales section, surface coating and plastics chemicals in Los Angeles of Oronite Division of California Chemical Co., a subsidiary of Standard Oil Co. of California. Taylor has been engaged in sales and technical service in the surface-coatings field for more than 20 years. He joined Oronite last year when the company acquired the resin making and laboratory facilities at Anaheim, Calif., from General Electric Co.

George T. Tobiasson is named ... special assistant to Col. J. C. Raaen, vice president and general manager of the research laboratories

of Universal Oil Products Co. Tobiasson will be responsible for coordination of activities testing at UOP. Formerly supervisor of the company's catalyst evaluation laboratory, Tobiasson has been with UOP 41 years, and was the company's first employe to reach the 40-year-service mark.

Harold B. Morgeson appointed

H. B. Morgeson

. . . general sales manager of the Valve & Fitting Division at Henry Vogt Machine Co. He succeeds Walter S. Cannon, Jr., who retired from the company after 40 years of service. Morgeson has served in various capacities with the Louisville firm since 1941.

Leland Equipment open house

. . . was held in Oklahoma City recently to inaugurate its new office, shop, and warehouse facility at 2640 W. Reno. More than 750 construction and oil-industry men attended the gathering.

The storage yard was used as a show room to display heavy equipment distributed or manufactured by Leland. With headquarter offices and manufacturing facilities in Tulsa, Leland maintains distribution and shop branches in both Oklahoma City and Longview, Tex. The firm was founded in 1925 as Leland Truck Equipment Co.

J. R. Peasley named manager

J. R. Peasley

. . . of Schlumberger Well Surveying Corp.'s northeast division with headquarters in Evansville, Ind. Since last year he has served in Oklahoma City as sales manager for the corporation's Oklahoma division. Moving up to the Oklahoma sales managerial post previously held by Peasley is J. T. Foster, former senior sales engineer in the Texas Gulf Coast division.

Six other Schlumberger reassignments include: V. H. Maraman, promoted to senior sales engineer at Wichita Falls; R. P. Spaugh, sales engineer at Tyler, transferred to the North Central Texas division office in Dallas; J. D. Matlock, former location manager at Shawnee, moved to Tulsa as senior sales engineer; J. M. Price, manager of the Ardmore, Okla. location, named to succeed Matlock in Shawnee; C. R. Ferguson, sales engineer at Kimball, Neb., moved to Farmington; and H. W. Valentine, location manager at Williston, N. D., promoted to division engineer and moved to the southern Rocky Mountain division with headquarters at Denver.

Midwestern Instruments names

. . . W. F. Wells as senior vice president and general manager, in which position he will exercise administrative control over Midwestern's engineering, manufacturing, and marketing functions. Wells goes to the Tulsa electronic-instruments manufacturer from General Electric Co. Since 1957 he has been manager of manufacturing engineering in the GE computer department at the Deep Valley Park plant in Phoenix.

Mal Myers becomes sales v.p.

. . . of OPW Division of Dover Corp. Myers started with OPW in 1952 as a sales engineer, and from 1956 to 1959 was West Coast district manager. For the past 2 years he has been manager of product engineering and development.

Daniel Orifice Fitting Co. enters

. . . the electronics field with the formation of a new division. Daniel Electronics will be headed by Larry J. Stroman, electronics engineer and former manager of Test Instrument Engineering at the SIE Division of Dresser Electronics.

The Houston manufacturer of fluid metering devices also announced the transfer of J. R. Wilson from Los Angeles to Houston where he will assist Stroman. An applications engineer, Wilson has had extensive sales experience at Daniel. James G. Cernosek, electronics technician, has joined the company for assignment with the new division.

L. J. Stroman

J. R. Wilson

Gayle Whiddon is appointed

Gayle Whiddon

. . . national representative—sales for Hughes Tool Co., according to W. H. Seims, vice president of sales. Whiddon goes to his new assignment in Houston after having been Dallas regional manager for Hughes since 1958. He joined the firm in 1934.

The company also appointed Emil E. Pagel as director of purchases and Gerald F. Bevill as assistant director of purchases. Pagel succeeds Earl R. Cobden who died last month.

George E. Hall named manager

. . . of sales development of Allis-Chalmers Mfg. Co.'s Construction Machinery Division. In this capacity he will be responsible for product sales information, sales programs, market and application studies, as well as coordinating advertising, exhibits, and trade shows.

Hall formerly served as construction-machinery sales manager and assistant branch manager at the A-C Los Angeles branch. In 1955 he was appointed Pacific Coast territory manager of the Construction Machinery Division. Hall became western region sales manager in 1958, and manager of the eastern region last year.

THE MOST SIGNIFICANT

Stewart and Stevenson announces the ALL NEW

NATURAL GAS CONVERSION

FOR GENERAL MOTORS SERIES 71 DIESEL ENGINES

WHY DO WE SAY IT'S THE MOST SIGNIFICANT ENGINE NEWS IN A CENTURY?

BECAUSE

For years there has been a growing demand for a true spark ignited, natural gas burning engine with the flexibility and superior performance characteristic of the General Motors Two Cycle Diesel Engine.

The development by Stewart & Stevenson Services of a Spark Ignition Conversion Kit for this great Diesel Engine offers a world of new advantages to prospective engine users as well as the owners of existing General Motors Diesel applications wherever lower cost, natural gas is available.

Now, you can enjoy "Jimmy Diesel" performance, long life and flexibility PLUS the advantage of being able to operate (through a simple conversion) on either Diesel fuel or straight natural gas . . . WITHOUT OWNING TWO TYPES OF ENGINES.

General Motors Series 71 Engines equipped with the new Stewart & Stevenson Spark Ignition Conversion operate on natural gas fuel developing full rated horsepower. Furthermore, their acceleration and lugging characteristics are simply amazing.

These new engines equipped for natural gas operation as well as the conversion kits available for older series 71 engines are thoroughly TRIED AND PROVEN.

They are the result of thousands of hours of exhaustive research and field testing over a period of more than three years.

Write today for more information on how these new Stewart & Stevenson Services developments can benefit you.

ENGINE NEWS IN A CENTURY

12 NEW SPARK-IGNITED MODELS

FROM 50 H.P. TO 1440 H.P.

MODEL 3SG
Horsepower.....50 to 76
Number of Cylinders.....3
RPM (Continuous Duty).....
.....1200 to 1800
Weight....1600 lbs., approx.

MODEL 4SG
Horsepower.....63 to 107
Number of Cylinders.....4
RPM (Continuous Duty).....
.....1200 to 1800
Weight....1800 lbs., approx.

MODEL 6SG
Horsepower.....100 to 163
Number of Cylinders.....6
RPM (Continuous Duty).....
.....1200 to 1800
Weight....2150 lbs., approx.

MODEL TWIN 4SG
Horsepower.....125 to 212
Number of Cylinders.....8
RPM (Continuous Duty).....
.....1200 to 1800
Weight....5000 lbs., approx.

MODEL 8VSG
Horsepower.....135 to 250
Number of Cylinders.....8
RPM (Continuous Duty).....
.....1200 to 1800
Weight....2550 lbs., approx.

MODEL TWIN 6SG
Horsepower.....200 to 326
Number of Cylinders.....12
RPM (Continuous Duty).....
.....1200 to 1800
Weight....5700 lbs., approx.

MODEL 12VSG
Horsepower.....200 to 360
Number of Cylinders.....12
RPM (Continuous Duty).....
.....1200 to 1800
Weight....3300 lbs., approx.

MODEL 16VSG
Horsepower.....275 to 500
Number of Cylinders.....16
RPM (Continuous Duty).....
.....1200 to 1800
Weight....5800 lbs., approx.

MODEL QUAD 6SG
Horsepower.....400 to 650
Number of Cylinders.....24
RPM (Continuous Duty).....
.....1200 to 1800
Weight..12500 lbs., approx.

MODEL TWIN 12VSG
Horsepower.....400 to 720
Number of Cylinders.....24
RPM (Continuous Duty).....
.....1200 to 1800
Weight..13500 lbs., approx.

MODEL TWIN 16VSG
Horsepower....550 to 1000
Number of Cylinders.....32
RPM (Continuous Duty).....
.....1200 to 1800
Weight..17800 lbs., approx.

MODEL QUAD 12VSG
Horsepower....800 to 1440
Number of Cylinders.....48
RPM (Continuous Duty).....
.....1200 to 1800
Weight..26000 lbs., approx.

STEWART & STEVENSON SERVICES, INC.

Main Office and Plant: 4516 Harrisburg Blvd., Houston 11, Texas
Phone CApitol 5-5341
Branches: Corpus Christi, Dallas, Lubbock, San Juan, San Antonio, Beaumont, Odessa
Representatives: Longview, Brownsville, Wichita Falls, Freeport, Galveston, Waco
Export: Room 1405, 74 Trinity Place, New York, N. Y.

STEWART & STEVENSON

THE WORLD'S LARGEST DISTRIBUTOR OF DIESEL ENGINES

CHICAGO PNEUMATIC · OIL TOOL DIVISION · FORT WORTH, TEXAS

ARE YOUR "DULLS" IN GOOD CONDITION?

Check out any CP "dull." You'll find tooth wear is uniform . . . no nubs or kicked-out cutters . . . cones that run free and true with no jammed bearings, no wobble.

These conditions are your best proof of our footage-producing tooth and bearing designs...exacting metallurgical controls . . . precise manufacturing standards.

The healthy condition of our "dulls" is your assurance of dependable performance in all formations.

At CP we know that you've "no time for downtime!"

GET THE HOLE-MAKING ABILITY you figured on from every bit you use. You can when you know it carries the CP trademark.

Chicago Pneumatic
FORT WORTH, TEXAS

BITS • DRILL COLLARS
REAMERS • TOOL JOINTS

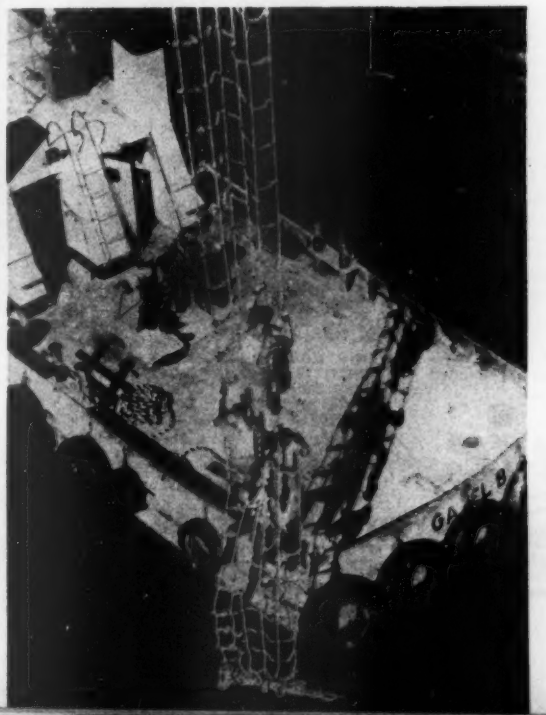
PRACTICE DRILL in abandoning platform, crewmen drop Navy-type debarkation net in preparation for climbing down into a waiting boat.

Debarkation nets aid escape

EMERGENCY ESCAPE from an offshore drilling platform is always hazardous. So Offshore Co. has installed a new device for hasty evacuation—the debarkation or "scramble" net.

Tool pushers and crewmen have rigged a small safety platform beneath the helicopter deck. The rolled-up scramble net, 60 ft. long and 5 ft. wide, is located on the safety deck ready for quick use. It will accommodate five men.

The net, while new, is only one of several means of escape for fire, hurricane, or other emergency. Ladders are installed on each of the platform's towers, ropes are hung from the sides, and a crane and personnel net are available.



SCRAMBLE NET is used to escape from drilling platform to standby boat in the emergency drill. The 60-ft. net is a lifeline to safety.

"500 TON"
TOOL JOINT COMPOUND
"POLARIZED"
additive increases "clinging" power for greater thread protection under mud and water pressures!

MONEY BACK GUARANTEE
Sold ONLY through supply stores

PETROLEUM DISTRIBUTING CO.
BOX 203 HOUSTON, TEX. U.S.A. CA 4-9648

Canadian drilling school set

A 3-WEEK COURSE in drilling engineering has been set for Banff, Alta., starting August 21. The school will be run by Preston L. Moore and Frank W. Cole, professors in the Petroleum Engineering School at the University of Oklahoma.

The curriculum has been designed to aid petroleum engineers who have been out of college for 8 to 10 years, or more, and who have a desire to learn about recent changes and advancements pertaining to drilling engineering.

Enrollment will be limited to 30 persons who have a degree in engineering. The course fee is $295 per man and will include a drilling-practice manual by Moore and Cole along with other course materials.

The topics covered during the session include: bit, weight, and rotary-speed selection, 1 day; drilling fluids, chemistry of clays and specific muds, 3½ days; drilling-fluid circulation, basis for friction loss, 2 days; lifting capacity of liquids, air or gas, and two-phase flow, 1 day; application of hydraulic horsepower, bit horsepower and impact, 3 days; air and gas drilling, experience and requirements, 2 days; slim-hole drilling, 1 day; minimum cost drilling, its basis and future application, 1½ days; and cements and cementing practices, 1 day.

More than 2 years have been spent preparing the material for the course and the drilling-practices manual, which is given to each engineer who attends. This manual contains about 350 pages of material on drilling practices including field data on factors that affect well costs. The copyrighted manual will not be available elsewhere.

Preston L. Moore has experience in drilling throughout the world and has spent 9 years with a major oil firm and 3 years as a professor at O. U. in petroleum engineering.

The cosponsor of the Banff school is Frank W. Cole, a member of AAODC committee on drilling research. He is the coauthor of a textbook on oil-well-drilling technology, now being used by 25 schools offering petroleum engineering.

Koenig INTRODUCES A REVOLUTIONARY NEW TYPE OF HEAVY-DUTY POWER WINCH

FEATURING TORQUE TRANSMISSION DIRECT FROM GEAR SPIDER TO DRUM . . . NO KEYS TO SHEAR
20,000 pounds safe hoisting capacity
Outstanding features of the NEW KOENIG WINCH:

★ Drum torque load is NOT transmitted by drum shaft . . . no keys to shear . . . torque is transmitted direct from gear spider to drum by means of multiple-splined collar in gear housing.
★ Entire unit, including safety brake, is lubricated by the oil-bath principle, with a generous supply of oil to prevent overheating.
★ Engineered to use standard lubricants available throughout the world.
★ Multiple-plate automatic safety brake, running in oil with one-direction clutch, is easily adjusted or released.
★ Accurate drum clutch position indicator.
★ Gear ratio — 36:1.
★ Nickel-bronze alloy worm gear. Hardened and ground worm mounted on Timken roller bearings.

Model 70B with stationary shaft

Pat. Pend.

Model 71B with catheads

THIS ADVANCED-DESIGN KOENIG WINCH IS RECOMMENDED FOR OIL-FIELD EQUIPMENT, PUBLIC UTILITIES, HEAVY WRECKERS, CONSTRUCTION, AND OTHER HEAVY-DUTY JOBS.
Koenig winches have served the industry with dependable pull and hoisting power since 1934. Koenig also builds a complete line of utility and service bodies.

Koenig IRON WORKS, Inc.
P. O. BOX 7726, DEPT. U • HOUSTON 7, TEXAS

Lake Erie set for 50-well program

THE 1961 DRILLING SEASON got under way in May and before the snow flies this fall more than 50 wells will be drilled in offshore Lake Erie.

The eastern part of the lake will bear the brunt of the attack with about 75% of the total effort expended there. The only major operator actively checking the west end is Consolidated West Petroleum, Ltd., with a six-well schedule slated.

MAP BIN FILE
LOW COST WAY TO FILE ROLLED MAPS, DRAWINGS
Heavy gauge steel bin, baked enamel finish, protective rubber bumper all around. Rolled items quickly located and refiled. Ideal in a limited working area. A great time saver.
40 heavy duty cardboard tubes 2" diam., 36" long.
BIN: 22" x 9" x 27½"
WITH FREE PLASTIC COVER $33.00
FOB, Tulsa, Okla. Weight 31 lbs.

SCOTT-RICE COMPANY
610 South Main St. Tulsa 19, Okla.

ACIDIZE WITHOUT DAMAGING CORROSION

with Halliburton's new MULTIPLE SERVICE ACID MSA

MSA is Halliburton's new acidizing medium combining acetic acids with inhibitors and surfactants. This new acid makes possible effective treatments in situations where regular HCl acid cannot be used due to temperatures or other well conditions which could cause damaging corrosion on tubing, casing, or pump parts.

MSA *for hot wells*

The slow reaction rate of MSA on limestone permits treatments of wells with bottom hole temperatures exceeding 250°F. Contact with down-hole equipment in excess of 24 hours can be allowed without corrosion damage.

MSA *as a perforating fluid*

A relatively small quantity of MSA can be used as the cement displacement fluid to bump the cementing plug and be left in the hole to help avoid perforation damage. Considerable rig time can often be saved with MSA since it is unnecessary to bump the plug with water or mud, swab, run a slug of HCl, perforate, and swab again. MSA can be used as a breakdown fluid to spearhead a fracturing treatment, if the fluid in the casing behind the MSA is compatible.

MSA *for removing scale*

A pump scaled with calcium carbonate can be treated *in the hole* with MSA to remove the scale. Even for extended periods, MSA exhibits little effect on chrome plated parts or stainless steel, and no damaging effect on aluminum, permitting this long contact without damaging the pump or the tubing.

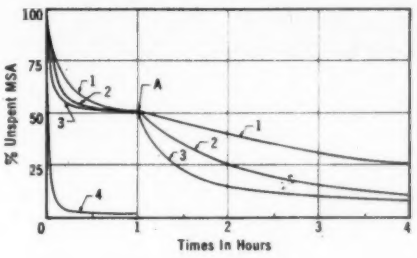
MSA *for leading conventional HCl treatments*

A slug of MSA spotted ahead of a regular HCl treatment will help improve results due to the retarding action of MSA which keeps live acid at the leading edge of the treatment for longer periods than faster reacting HCl.

These are but a few examples of the many new applications being made possible by MSA. Check with your Halliburton man for the latest details — and the full story on how MSA may increase stimulation results for your wells.

Two samples of P-105 steel subjected to a 72 hour acid exposure test at 250° F. (left) in MSA and (right) in HCl acid. Note the excessive pitting caused by HCl with the effect of MSA on the other sample barely noticeable.

REACTION TIMES ON LIMESTONE
MSA vs HCl



A. Pressure released from 1000 P. S. I. to atmospheric pressure.

8.4 CM²/MI (Equivalent to 0.1 inch fracture)

1. 80° F.
2. 160° F.
3. 240° F.
4. 15% HCl @ 1000 P. S. I., 80° F.

275 SERVICE CENTERS . . .
JUST MINUTES AWAY FROM YOUR WELL

CHEMICAL SERVICES

Halliburton
COMPANY · DUNCAN, OKLAHOMA

"Huntress" is her sleek, efficient self again, at work on location for Dixie Drilling Company, after her overhaul at Avondale Harvey.

The 180' inland drilling barge suffered severe fire damage—requiring repair or replacement of structurals and equipment, installation of new rotary. While she was in, her quarters and change room were modified and a new helicopter deck was installed.

The work was done efficiently and fast by the Oil Tools Department of Avondale Harvey —specialists in rig repair and overhaul.

Avondale Harvey combines drydocks, marine machine shops, oil tools shops and specialized technical know-how into a complete, "one-stop" drilling equipment service. Avondale Harvey is at your service day and night.

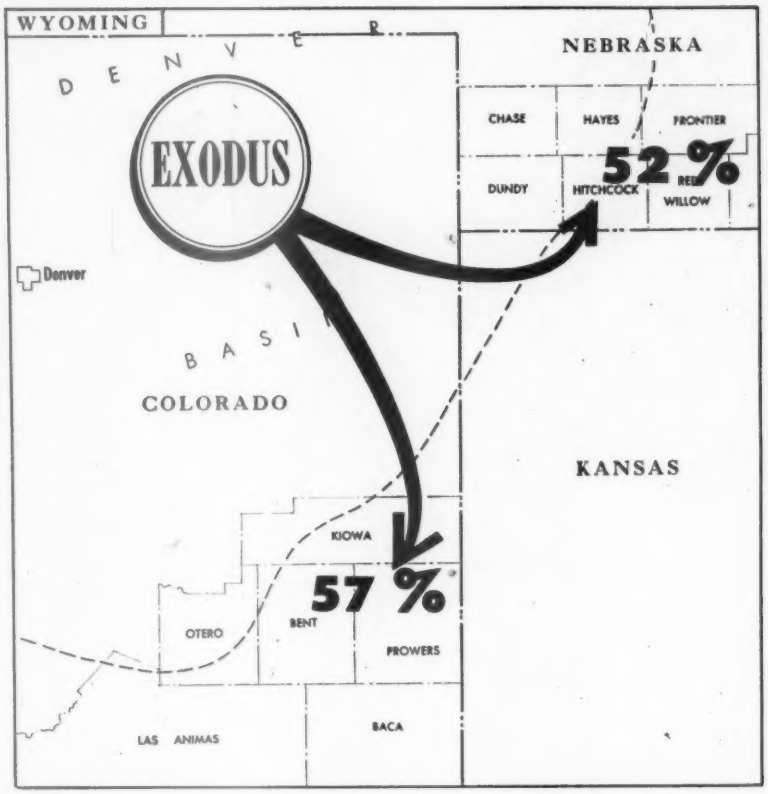
AVONDALE SHIPYARDS, INC.
HARVEY QUICK REPAIR DIVISION
P. O. BOX 116, HARVEY, LOUISIANA • PHONE Fillmore 1-4211

Drive compound for draw-works

Tool pusher's office with drilling control indicators

Crew's lounge

Helicopter flight deck



RECENT WEEKS have seen an upsurge in drilling in the southeastern counties of Colorado and the southwestern counties of Nebraska. For the first time, these areas outstrip the Denver basin in total activity.

Outlying areas dim luster of Denver basin

BY FRANK J. GARDNER

ONE OF THE more interesting exploration stories of 1961 is the shifting centers of interest in the southeastern Rocky Mountain province.

It's a double-shift, too, one facet concerning Colorado, the other Nebraska. For the first time in 12 years, the Denver basin is dethroned as target No. 1 in this province.

Examination of current scout reports reveals that 57% of all eastern Colorado drilling (wildcat and field) now centers in the southeastern corner of the state, along the Las Animas arch. And that 52% of all Nebraska drilling centers in the southwest corner of that state, rather than in the panhandle.

A new shift . . . This interesting development was revealed in a recent study of Colorado drilling by Petroleum Information of Denver. According to PI, the six southeasternmost counties of Baca, Bent, Kiowa, Prowers, Otero, and Las Animas are stealing the show from the Denver basin for the first time, and only in recent weeks. "This area," says PI, "has had a recent sharp rise in activity . . . so recent that it is not materially reflected in completion statistics. Through mid-May, completions . . . were substantially lower than in Denver basin counties. The rise in drilling, however, has established a current rate of operations considerably higher than that in the Denver basin."

Intrigued by these findings, the Journal staff expanded the area of study to include Nebraska, and came up with these additional conclusions: (1) the rise in current operations extends to Southwest Nebraska's Kaneb country, and reflects a six-county parallel to the Colorado situation; (2) unlike Colorado, total completions through mid-June in the Kaneb embayment exceed those in the Denver basin center.

Shows up in statistics . . . At the moment, 36 of the 63 active wells in eastern Colorado lie in Baca, Bent, and Kiowa counties; western Nebraska has 123 active wells, and 64 of these are in Frontier, Hayes, Chase, Dundy, Hitchcock, and Red Willow counties.

What's behind this exodus from the Denver basin to outlying regions? On the basis of wildcat success, it's a little hard to justify, but field drilling success is another story. Red Willow County, Nebraska, for instance, is running neck and neck with now-famous Kingfisher County, Oklahoma, with 139 hits out of 146 tries in field drilling; but wildcats in Red Willow have scored a miserable 5 out of 51. Dundy County, west of Red Willow, has done better, but on a much smaller scale; here, 4 out of 10 wildcats have hit pay, and all offsets have been successful.

Baca County, Colorado, with activity centered on Midway field, has seen 2 discoveries out of 7 wildcats, and 8 out of 13 field wells have hit.

Add to this drilling record the attraction of a new theater of operations, ample acreage on the available list, multiple-pay prospects, and the tag "independent's country," and you may come up with the explanation for this unexpected development in Rocky Mountain operations.

Be sure of this standard to be sure of the standard you specify

The TUBE-TURN trademark is more than a *trade* mark. It identifies a *standard* of performance and satisfaction. It has universal recognition and acceptance as a mark of *known* value.

TUBE-TURN components for welded piping systems are the product of decades of pioneering, of a wealth of experience without equal, of an investment in related research and engineering exceeding that made by all other such manufacturers *combined*. These are important considerations in this era of widespread deceit and subterfuge.

Simply copying TUBE-TURN products is an obviously easy shortcut to look-alike substitutes. When such impostors sneak into jobs through the "or equal" loophole in many specifications, however, it is impossible to be sure they meet TUBE-TURN standards. Only costly and time-consuming laboratory testing can prove it. And such testing, if undertaken, cannot be conclusive because the proper tests destroy the samples and there is never assurance of uniformity in any quantity delivered.

The substitution of *anything* for genuine TUBE-TURN welding fittings and flanges is difficult to understand or justify. TUBE-TURN quality demands no premium. TUBE-TURN products are always priced competitively with truly comparable items. Any so-called "bargain" substitutes *must* be substandard in value! What "saving" can possibly justify the risk involved when a single failure may easily result in losses greater than the cost of the entire piping installation?

Inferior Substitutes Can be Avoided!

Specifications calling for TUBE-TURN products with the customary "or equal" wording need not be the open door to risk or trouble. Responsible suppliers and contractors will not only serve you honestly and properly, they will be glad to provide proof of it. They will give you an affidavit that they have met your specifications to the letter . . . and they will identify and describe whatever substitutes they elected to supply within the "or equal" latitude allowed. This is a sensible procedure for everyone concerned. Write us today for a copy of Bulletin 1031 F218 on this subject. TUBE TURNS, Louisville 1, Kentucky.

"TUBE-TURN" and "tt" Reg. U.S. Pat. Off.

TUBE TURNS

Division of [redacted] *Corporation*

LIFESAVER For The Men Who Design Piping

Tube Turns offers not only the most complete line of properly engineered welding fittings and flanges for utmost flexibility in planning any piping installation, but a wealth of technical data and able engineering assistance without counterpart anywhere in the world. Standardizing on TUBE-TURN piping components saves time and trouble.

LIFESAVER For The Men Who Buy Piping

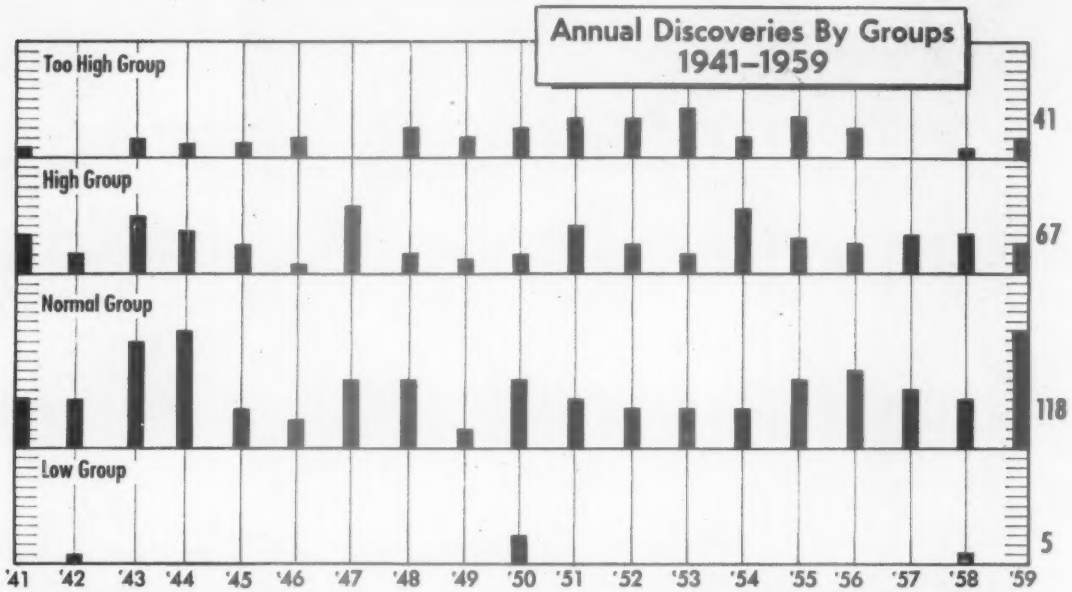
The world's most complete line of welding fittings and flanges, over 12,000 regularly stocked TUBE-TURN items, permits every specification to be met without compromise or delay. A fully responsible Tube Turns Distributor is as near as your telephone to give prompt delivery of *all* your needs from *one* source on a *single* order. Saves time, paperwork, multiple checking, piecemeal deliveries and the inevitable problems of divided responsibility. You *save* money when you standardize on TUBE-TURN piping components!

LIFESAVER For The Men Who Install Piping

Time is money in the assembly of a welding piping system. TUBE-TURN welding fittings and flanges do not require remanufacture or compromises . . . or the delays that result from rejections. They are uniform, precision-engineered for easy, time-saving installation. And you can put them in and *forget* them because they *are* dependable. TUBE-TURN piping components cost less because they save more in every way!

TUBE-TURN Welding Fittings And Flanges Are Stocked By And Sold Exclusively Through Authorized Distributors.

PART 2



NEW POOLS discovered during a 19-year period from 1941 through 1959 in Kansas totaled 2,057. The 16 firms under study accounted for 231 of these, or 11.5% of the total. Number of new fields found by each group are shown at the right.

The Normal group has demonstrated that

Good practices are the key to success in oil-finding

"The company with the well-rounded attack has been much more successful . . . rarely does a noncontributor participate in Kansas new-field development."

BY EDWARD A. KOESTER
Petroleum Consultant, Denver

THE COMPANIES in the Normal group seemed to have the secret of finding oil and operating successfully in Kansas. What are the features of their exploration program? In 1941, the following characteristics of a successful exploration program were determined:

1. The exploration department of a successful oil finder has a thorough knowledge of the surface and subsurface geology of the state. It also has an open mind and the flexibility to take advantage of discoveries in outlying areas where it may not hold acreage.

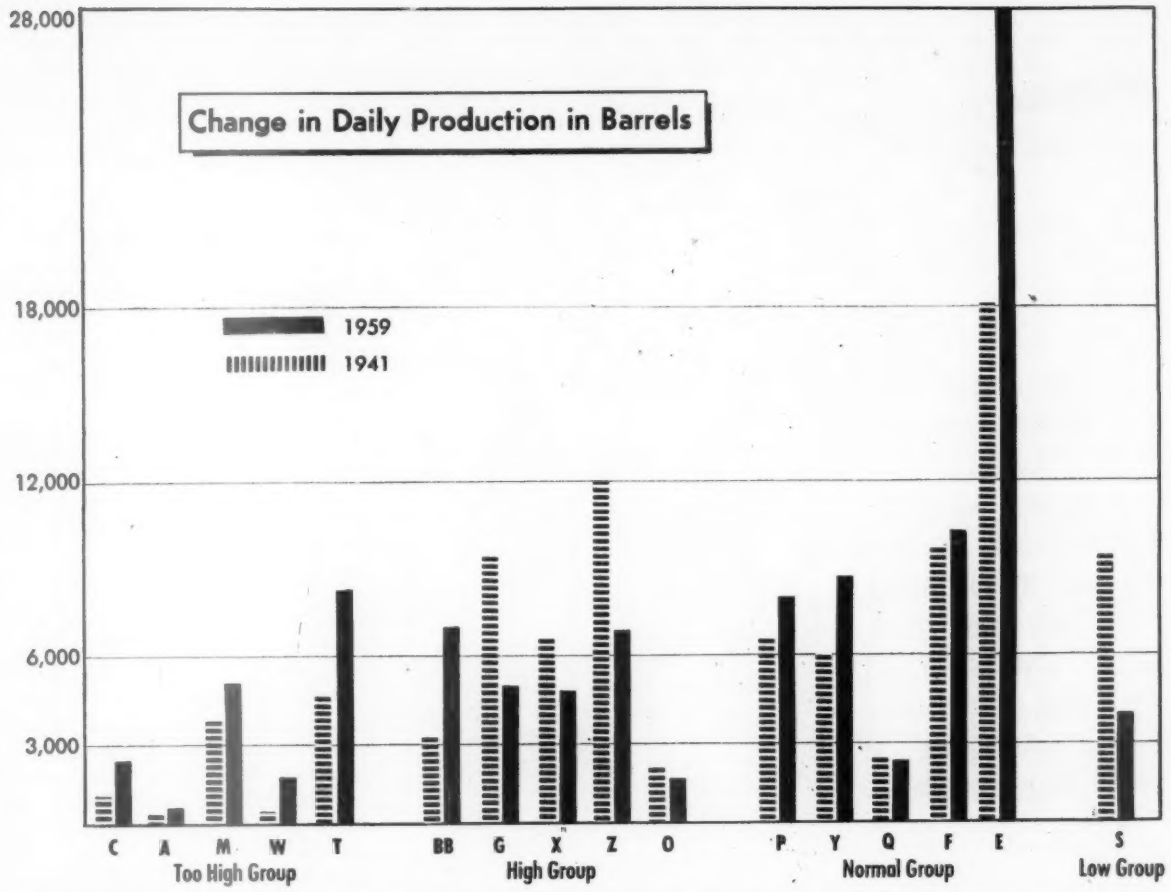
2. A leasing policy which provides for a liberal checkerboard in active areas as well as the assembly of blocks which have been screened by the core drill, seismograph, or surface geology. Random checkerboard leases in a dead area are valueless.

Carefully chosen leases based on a geological or geophysical basis in an active area or an area about to become active may be expected to achieve some value. Rank wildcat blocks rarely may be expected to contribute to a company's exploration success.

But wildcat blocks based on sound geological and geophysical bases may be expected to contribute to future profitable production. No company can expect to develop its production in Kansas on wholly owned blocks alone nor on checkerboards.

3. A prudent use of all geological and geophysical tools with no reliance on any particular exploratory method is needed. This feature should apply universally. Sole reliance on the seismograph as a tool has been the cause of several exploration fiascos. The company with the well-rounded attack has been much more successful.

4. Cooperation and mutual faith



PRODUCTION GROWTH FACTORS for the respective companies are seen in this graphic illustration. Note that the normal group didn't fall off (except Q where loss is small) as did some firms in the high group.

between the district office and the head office is also advisable. This implies that the district office has the authority as well as the responsibility to act in its sphere.

The normal companies have followed this policy almost completely. Since this study was made in 1941, some of the companies outside the Normal group have changed their policy to include it. It seems to have been the forerunner of the decentralization policies about which we have been hearing in recent years.

An interesting corollary of this seems to be that a company that has had few changes in exploration personnel, particularly in the geological department, has been more successful than those that have frequent changes.

5. A willingness to support exploration by the contribution of dry-hole or bottom-hole money and the purchase of spreads is essential.

The Normal group companies have proved this repeatedly, but those companies that have refused to support have proved it equally as convincingly. The purchase of checkerboard leases implies that these may become valuable only if drilling is done in the area and production is found. If exploration is stymied by the refusal of companies to support drilling, the purpose of the checkerboard is defeated.

In some instances the discovery of a field has been delayed until the leases of a noncontributor have expired. Some of the noncontributors of the forties now occasionally support wildcatting with dry-hole money and have met with some success. However, rarely does a noncontributor participate in the development of a new field in Kansas.

The Test of the Formula

If the attributes of the exploration policy of the companies in the Normal group were correctly described in 1941, and we are correct in assuming that their exploration policies are the right ones, they should have enjoyed more than normal success in exploration in subsequent years.

Let us look at the record. Unfortunately, data on the profits made by those companies in Kansas since 1941 are not available. However, at least two criteria can measure their success—their ability to discover new pools, and the success in increasing daily production.

Pool discoveries. Data on new discoveries in the period 1941-1959 are shown in Chart 1. In this chart, each new discovery (regardless of size or importance) by one of the 17 companies is listed as shown in the annual review of development for Kansas, or from data in the author's files. The information is essentially that of the Committee on Exploratory Drilling of the

AAPG, but does not include deeper-pool tests and shallower-pool tests as now used by that committee, because such distinctions were not made in the early period of compilation.

On a purely numerical basis, the companies in the Normal group have shown their ability to outperform their competitors in the discovery of new producing areas. These five companies discovered 118 new pools or fields in the 19-year period while 11 competitors have found only 113 such discoveries. Cursory examination of the Normal group discoveries shows that they represent better-than-average discoveries, whereas many of the discoveries of the other groups were small and of little importance. Moreover, some of the discoveries of the Normal group were of greater significance in that they were in rank wildcat areas.

The Normal group companies have also shown a consistency in profitable wildcatting in Kansas not generally enjoyed by their competitors. In the 19-year period, Company E has had one or more discoveries in every year except one. Company Y has made discoveries in 14 years, and Company F in 13 years, while Company P has spread its significant discoveries over 11 years.

Only two companies, Z and T, outside the Normal group have made discoveries in as many as 13 years, and many of these have been unimportant. The other company in the Normal group, Q, has made discoveries in only five of the 19 years and has found but one pool in the past 10 years. In fact this company has changed the policy it followed in 1941 and has closed its office in Wichita. However, four of the companies outside the Normal group have retrenched to the extent of closing their Wichita offices.

Ability to increase production. Chart 2 shows the average daily production in Kansas of the 16 companies at the beginning of 1941 and for December 1959.

The figure for Company BB is the combined production of companies B and H of Table 1, while the figures for 1959 includes the effect of the merger of these two companies plus three companies not shown in Table 1. These three companies in 1941 had a greater daily production than companies B and H combined, so the increase is misleading. There are other factors that have had a bearing on the change in production of the various companies which will be discussed later.

The Normal group companies increased their daily production in Kansas between 1941 and 1959 from 42,961 bbl. to 57,123 bbl., whereas the 11 companies outside this group suffered a decline in production from 53,353 bbl. to 46,871 bbl. This certainly indicates that the Normal companies have been successful in following the formula for exploration outlined above. It emphasizes that the five features of the formula have produced results.

In the 19-year period under study, 2,057 new pools were discovered in Kansas; of these, only 231, or 11.15%, were found by the 16 companies. Although most of the wildcats drilled in Kansas have been owned by independent operators, the large companies have been paying for a large share of this exploratory drilling through the purchase of spreads and the contribution of dry-hole and bottom-hole money.

At times, this share probably has amounted to as much as 50%. Seldom has an independent wildcatter been willing to give a company a free ride. Because they have been more willing to contribute dry-hole money than others, the five Normal companies have participated in the greater part of these 1,826 discoveries. This has been an important factor in their ability to increase their production.

Two factors that bear on the change in production of the various companies in the 19-year period are the purchase of production and secondary recovery. Neither of these is an exploration activity. Yet they have had different effects on the production figures of the companies in this study.

It has been pointed out above that the merger of five companies into Company BB has given a misleading impression of the exploration success of companies B and H. In Chart 2 it has resulted in an apparent increase of about 3,800 bbl. daily for Company BB. Ac-

"Thorough geological and geophysical knowledge . . . liberal checkerboard leases in active areas . . . cooperation and mutual respect . . . and willingness to contribute . . . " are prime ingredients for exploration success.

tually, one of the merged companies alone contributed 5,500 bbl. of daily production when it was merged into Company BB in 1944. This still represents a large share of the production of Company BB.

Likewise, the increase in production of Company C and Company T may be attributed to the purchase of developed and semideveloped producing properties of considerable size. Similarly, the purchase of properties capable of producing about 1,000 to 3,000 bbl. per day at the time of purchase has failed to prevent a decline in production of Company X and Company Z. None of the other companies in the survey has purchased any appreciable amount of production in the 1941-1959 period.

Water flooding or other types of secondary recovery of the shallower fields of Central and eastern Kansas has increased the daily production of several companies. This applies particularly to production from the Burbank shoestring sandstone field of Greenwood, Butler, and Cowley counties.

The companies outside the Normal group so affected are M. T, BB, X, and O. Secondary recovery has affected to some extent companies P and E in the Normal group. The effects of water flooding is shown vividly in the case of Company W. Its increase in production may be attributed wholly to water flooding of one group of leases which were originally developed 40 years ago.

Each of the companies covered by this study has been operating in Kansas for at least 40 years, some of them longer. Some have been less consistent than others in their activity, making a great foray in the state involving large expenditures for leasing and drilling.

Such spasmodic bursts of exploration enthusiasm followed by periods of quiescence have seldom yielded results. Often these periods of activity have been followed by a farmout program from which certain alert independent operators have reaped rich rewards as they have developed the handouts of the major companies.

Meanwhile other, and generally smaller, companies have opened exploration offices in Kansas and have successfully built up their production to levels which equal or exceed the production of some of the older companies. At least six companies have built up production to 2,000-3,000 bbl. per day. These successful newcomers have followed in general programs that more closely match the exploration policies of the Normal group companies than those of the other groups.

Other newcomers who did not adopt these policies have failed to develop substantial production. When the production of all companies attributable to mergers, purchases, and secondary recovery is deducted from the 1959 production figures, the successful application of the formula is emphasized.

This study has not been monographic in character. Two norms, ability to find new pools, and ability to increase production by exploration, have been used to test a company's efficiency in exploration. Other tests could be used, such as amount of developed new reserves, but this information is not generally available. However, it is felt that the application of such tests would merely confirm the conclusions reached here.

This study pertains only to Kansas and only for the period covered by it. A review of the situation at the end of 1947 produced similar results. All of the components of a successful exploration program in Kansas would not necessarily apply in a public land state, such as Wyoming or Montana, nor would they be applicable to the same extent in the salt-dome country of the Gulf Coastal states. But the fundamental principles should apply elsewhere.

A geologist has described the features of the formula outlined above as:

- Knowledge.
- Moderation.
- Delegation of authority.
- Aggressiveness.
- Cooperation.

The author can give no better summary.

Acknowledgments

Grateful acknowledgment is expressed to the many persons who have assisted the writer in the preparation of this study, particularly W. G. Tierney, T. A. Morgan, H. O. Smedley, John W. Inkster, A. M. Bruner, W. A. Ver Wiebe, William C. Imbt, E. R. Elledge, Don W. Payne, L. H. Cornell, and Fred S. Jensen.

Two discoveries reported in northwestern Kansas area

Oil production is reported at a pair of discoveries in northwestern Kansas, one in Decatur, one in Graham County.

The Decatur County wildcat, Empire Drilling Co. 1 Katha, C SE NE 7-1s-28w, 7½ miles west of Van Vleet field and 3½ miles east of Cedar Bluffs, is testing in Lansing-Kansas City Pennsylvanian. The well swabbed 15 bbl. of oil the first hour from perforations at 3,608-18 ft., 15 bbl. the second hour, 11 bbl. the third, 10 bbl. the fourth, and 9 bbl. the fifth. Testing continues.

Graham County. Empire 1 Culp "A," C NW NE 21-10s-24w, 1½ miles southeast of Bryan field and 13½ miles southwest of Hill City, flowed 30 bbl. per hour on 15/64-in. choke from Lansing at 3,839-45 ft. On 10/64-in. choke it made 15 bbl. hourly.

Pawnee County. Mull Drilling Co. set casing at 1 Holman in C NE SE 22-20s-19w at a confirmation well to a Cherokee Pennsylvanian discovery. The new well got 120 ft. of clean gassy oil and 900 ft. froggy oil, no water, on drill-stem test at 4,232-90 ft. The discovery well, 1 Harms, NW SE NW 23-20s-19w, pumped 2½ bbl. per hour from Cherokee perforations at 4,218-23 ft.

The field has a newly located well at Ralstin 1 Ideker, C NW SW 23-20s-19w.

Barber County. Lario Oil & Gas Co. confirmed Douglas Pennsylvanian gas production in Southwest Ils field, Barber County, southern

Kansas. The 1 Watkins-Nelson unit, NE NE SE 17-31s-11w, flowed 1 M.M.c.f.d. from 14/64-in. choke from perforations at 3,759-63 ft.

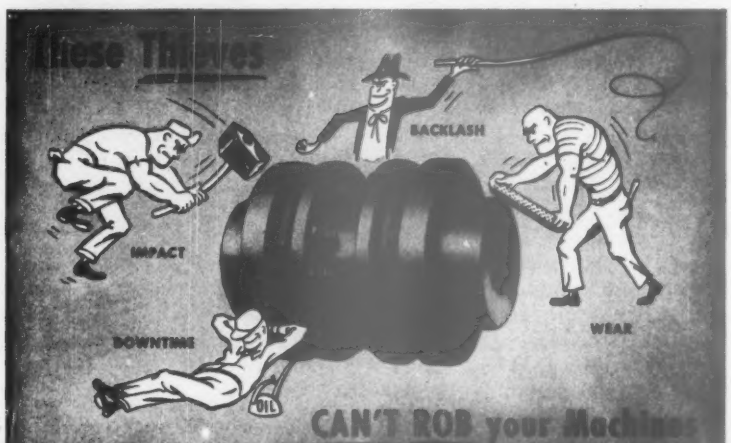
The discovery well, completed in 1959, was the 1 Axline, NE NW NE 17-31s-11w, 4½ miles northeast of Medicine Lodge. It flowed 10 M.M.c.f.d. from Douglas at 3,766-70 ft.

Kentucky well completed

In Wolfe County, eastern Kentucky, L. C. Young has completed a good gas well at 1 D. Tyra. Test was located 2,510 ft. from south line and 2,000 ft. from west line of 22-O-73. Top of the producing Corniferous formation was found at 1,496 ft. and drilled to a total depth of 1,504 ft. After 1,000 gal. of acid the well gaged on open flow 3,100 M.c.f.d.

New wildcat completed near Opelousas, La.

Gulf Oil Corp. reports completion of a new field wildcat just west of the city limits of Opelousas, St. Landry Parish, Louisiana.



Think of the losses incurred by maintenance costs, lubrication, down time and damage to connected machines by inadequate couplings.

High degree of accuracy, reliability and performance make Thomas "All-Metal" Flexible Couplings the best in the world . . . . . the only Flexible Couplings designed on the Correct Principle to give lifetime service without maintenance.

UNDER LOAD and MISALIGNMENT only THOMAS FLEXIBLE COUPLINGS *offer all these advantages:*

- Freedom from Backlash
- Torsional Rigidity
- Free End Float
- Smooth Continuous Drive with Constant Rotational Velocity
- Visual Inspection While in Operation
- Original Balance for Life
- Unaffected by High or Low Temperatures
- No Lubrication
- No Wearing Parts
- No Maintenance

The Thomas principle of design makes possible the widest range that can be attained in speeds, horsepower, sizes and styles.

THOMAS FLEXIBLE COUPLINGS

Write for Our New Engineering Catalog 60

THOMAS FLEXIBLE COUPLING COMPANY

WARREN, PENNSYLVANIA, U.S.A.

Gulf's 1 Richard tested a 32-ft. pay at a depth of 10,800 ft. on a ¼-in. choke, the well flowed at a rate of 7 M.M.c.f.d. plus 292 bbl. of condensate, with a tubing pressure of 4,450 lb.

The wildcat is located on a 2,000-acre Gulf block.

Williston extension wells completed in North Dakota, Montana

A Dwyer field extension well, Signal Drilling & Exploration Co. 1 St. Clair, SE SE 13-32n-58e, Sheridan County, Montana, flowed 400 bbl. per day.

Production is from Madison Mississippian lime perforations at 7,815-18 ft. through 16/64-in. choke. This is the east offset to 1 Anderson in C SE SW 13-32n-58e, which flowed 150 bbl. per day from notches at 7,749-75 ft.

North Dakota. Clyde Jones 1 Bergstrom, C SE SW 23-163n-83w, Bottineau County, North Dakota, flowed 173 bbl. per day to extend Haas field to the northwest. Production is from Mission Canyon Mississippian perforations at 4,008-13 ft. through 16/64-in. choke.

New pool opened in Red Willow, Nebraska

Champlin Oil & Refining Co. completed 1 Tiller et al., in C SW SE 14-3n-27w, Red Willow County, southern Nebraska. The well pumped 49 bbl. of oil per day.

Production is from open hole in basal sand at 3,407-28 ft. This new field is 1½ miles north of Lansing-Kansas City and Reagan or basal sand production at Sleepy Hollow. Sleepy Hollow has since moved to within 1 mile of the new discovery.

Nebraska's Dundy County gets new production

In Dundy County, Nebraska, Sunray Mid-Continent Oil Co. has opened new production at 1 Shafer, C SE NW 31-3n-37w.

The well is located 9 miles north of Benkelman, Neb., and 1 mile east of Indian Creek field.

Final tests pumped 130 bbl. of oil a day from perforations at 4,238-54, 4,287-97, and 4,436-42 ft. op-

posite the Lansing-Kansas City zone. The hole was drilled to 4,560 ft.

The well is the fourth exploratory test drilled by Sunray in Dundy County during recent months and resulted in four new oil field discoveries, Indian Creek field, Pierce Lake field situated 2½ miles southeast of the 1 Shafer and Callison field located 1½ miles northeast of the new discovery. Sunray holds approximately 5,120 acres in the immediate area.

Queen discovery has big flow in Southeast N. M.

A southeastern New Mexico wildcat flowed 649 bbl. of 36°-gravity oil on a potential test through 28/64-in. choke in the Queen sand of Permian age. The well is Don C. Wiley and Dick Lowe 1-Q Mobil-State, 36-17s-33e, ¼ mile south of a San Andres Permian producer.

The well is located in western Lea County, New Mexico, 8 miles southeast of Maljamar.

New Mexico field gets confirmation

A Premier Permian sand discovery in northeastern Eddy County, Southeast New Mexico, was confirmed by Leonard Oil Co. at 1 Midwest, ½ mile southwest of the Trigg 1-5 Federal discovery well, 10 miles northwest of Maljamar.

The confirmation discovery flowed 113 bbl. of oil per day on 24/64-in. choke from perforations at 3,390-3,430 ft. Location is in 8-16s-31e.

Halley field. Skelly Oil Co. 172 S. M. Halley, Halley field, Winkler County, West Texas, flowed 4,943 M.c.f.d. with a gas-liquid ratio of 17,900 cu. ft. per bbl. The well, 9 miles southeast of Kermit, was completed from Devonian at 9,867-87 ft. From Ellenburger at 12,042-64 ft. the well made 585 bbl. of oil per day on 20/64-in. choke. Well is 3 miles south of Devonian gassers at Emperor field. Location is in Section 24, Block B-11, BSL Survey.

Only one deep gasser finaled in Pennsylvania

The only producing well completed in Pennsylvania this month in the deeper horizons was Mallory 2 in Foster Township, McKean County. This is the second producer in the Mallory pool, Bradford field. Production is from the Oriskany (Lower Devonian). The well, owned by Ritzos and McBride, was drilled 8 ft. into the Oriskany, was shot with 15 qt. of nitro, and produced 3 M.M.c.f.d. at a rock pressure of 1,866 psi. in 47 hours. In the meantime, the first well was putting 400 M.c.f.d. into the line daily against a bottom-hole pressure of 1,200 psi. Most of the acreage in this area has been leased by the Mallory operators.

Erie. An outstep to Burgess field in Erie County found salt water in the Oriskany and salt water and a show of gas in the Medina. After fracturing, the well produced 45 M.c.f.d. at 670 psi. in 41 hours and 850 ft. of salt water from a 4½-in. hole. The well has been capped and shut in.

Jefferson. An outstep to Sykesville pool in Jefferson County, the 2 Burt Walls by New York State Natural Gas Corp., had only salt water in the Oriskany and was plugged and abandoned.

Heralding
Hunt of FIRST
'Hunt' a Better Deal in Oil Banking!
Not even this business crest can show all the facets of Executive Vice President Russell F. Hunt's career. From law to oil and industry; from Cumberland U. to the Tulsa Chamber of Commerce; from busy colonel to banking and currency; his is a background rich in both public and private affairs. And thanks to his personal experience in the industry, Russell Hunt knows oil men's problems! If you're hunting for the best in oil banking, from one of the most able and experienced oil departments in America (with one of the nation's largest oil-credit files), just . . .
Think . . . 1st Tulsa
FIRST NATIONAL BANK AND TRUST COMPANY of Tulsa
MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION
SINCE 1895

Wildcats. In the wildcat department, the T. Gasick by Atlas Drilling Co. and Sun Oil Co. had a hole full of water in the Oriskany and a show of gas. This well was drilled in Crawford County. The hole was perforated, fractured, and abandoned.

In Potter County on the Marshlands anticline, a wildcat drilled by Felmont Oil Corp. on State of Pennsylvania Tract 88-1, found only 1 ft. of Oriskany horizon and was plugged and abandoned. The third wildcat completed during the month was the G. W. Gordon 1 by John Galey et al. in Franklin Township, Greene County, on the Bellevernon anticline. The Oriskany was dry, and the well was plugged back and completed as a shallow gas well.

Phillips Petroleum Co. is drilling its third well in the area where they made an Oriskany discovery. This third well is being drilled on the Pennsylvania Tract 26 in Bedford County. The company will core the Oriskany horizon. Only a couple of other wells in the state have cored the Oriskany.

An interesting wildcat is the A. Pardee Estate 1 by New York State Natural Gas Corp. in Shippen Township, Cameron County. This well is trying to find the Oriskany on the southeast flank of the Sabinsville anticline. If they are successful, this will extend the Boone Mountain trend 20 miles to the northeast.

The Fred Post well by Benedum-Trees in Crawford County on the Indian Springs trend has found 2 M.M.c.f.d. of gas and operations are continuing. Other wells being drilled on this trend are Revak 1 by Atlas Drilling Co. and Sun Oil Co.; Fred Carter by S. McClusky, located at the southwest end of the trend next to the Ohio line; and Vanco by Redfern and Hurd of Midland, Tex., in Erie County on the northeastern end of the trend.

Drilling speeds up in West Canada

DRILLING activity in western Canada has taken a sharp rise in the past month with 192 rotary drilling rigs now engaged.

The active total shows 162 units operating within Alberta's borders, 19 at work in Saskatchewan, 9 operating in British Columbia and a pair in the Northwest Territories. As of 1 month ago, the first week of May when road bans were still in effect in many areas, the tally showed just 113 rigs on the operating list, including 85 in Alberta, 18 in Saskatchewan, 6 in British Columbia and 4 in the Territories. As of the previous survey date an additional 12 rigs in Alberta were under contract but not operating due to road bans.

A look at present activity in terms of exploration and development shows 143 rigs drilling on field-development wells as opposed to 49 on wildcats. On a provincial basis 120 of Alberta's 162 rigs are on development work and 42 on wildcats. In Saskatchewan the ratio is very similar with 15 on field wells and 4 on exploratory ventures. British Columbia shows 7 on field locations and 2 at wildcat wells and in the Territories 1 wildcat is under

Canada May completions—1961

	Total wells							Wildcats					
	Total	Oil	Gas	Dry	Service	Footage	1961 cum.	Total	Oil	Gas	Dry	Footage	1961 cum.
Western Canada	117	75	16	25	1	610,784	831	26	5	5	16	161,838	252
Alberta	66	36	15	14	1	403,514	548	17	5	5	7	120,461	164
Saskatchewan	45	37	0	8	0	176,858	190	6	0	0	6	23,135	26
Manitoba	1	1	0	0	0	2,093	10	0	0	0	0	0	1
British Columbia	2	1	1	0	0	10,077	70	0	0	0	0	0	48
Northwest Territories	3	0	0	3	0	18,242	13	3	0	0	3	18,242	13

way and the second active rig is engaged in service work.

During the first week of June in 1960 total rig activity was tabbed at 179, with 136 in Alberta, 24 in Saskatchewan, 2 in Manitoba, 15 in British Columbia and 2 in far-northern Canada.

Alberta's south. Alberta, which now accounts for over 84% of all western Canadian drilling activity, shows another interesting development when a closer look is taken of rig activity by areas. It is most interesting to note that the southern district of the province—that is, lands south of an east-west line through Edmonton city, presently account for 64% of all drilling in Canada's No. 1 oil and gas province. It is true that northern operations are more easily carried out in the winter months but it is also a fact that operations in southern Alberta has been higher than is usual for summer months this year than in the past number of years.

For example 36 out of the 42 wildcats now under way in the province are in the south. The balance of the south's drilling activity is made up of 68 rigs on field wells. When it is taken into account that 30 of the 58 rigs working in northern Alberta are grouped in the general Swan Hills development region it is obvious that other drilling operations within the province are spread quite thin.

Gas development is playing a major role in current activity in the south. This is due to supply companies preparing to start gas deliveries late this fall to Alberta & Southern Gas Co. and Westcoast Transmission Co. Particularly significant in this category are the Waterton Park and Crossfield development projects.

Shell Oil Co. is currently operating five rigs at Waterton Park and is scheduled to move additional equipment to the area shortly. This play could be classed as the most significant in the province since each hole will cost between $600,000 and $750,000 before being completed and placed on production.

Both large and small operating companies are taking a much more constructive look at southern Alberta's plains at present. This re-

NOW we're all...

gion, very roughly lying east of the fifth meridian from the Montana border to the east Edmonton area, before the discovery of oil at Leduc in 1947 was the major exploration area in the province. At present it is being more actively explored than during the past 6 or 8 years. The search has paid off for some operators with both oil and gas discoveries recorded. Nothing of major size as yet but apparently quite commercial—if not too many dry holes are drilled in efforts to delineate the various discoveries.

Individual wells that have done a great deal to swing the oil-industry spotlight back to southern Alberta must include Home Oil's multizone gas discovery in the Knappen area of extreme southern Alberta, Canadian Pacific Gas & Oil, Ltd., and Zapata Canadian Petroleum Corp.'s string of gas and oil successes at Hussar about 60 miles due east of Calgary, and Hunt Oil Co.'s discovery at Buffalo Lake 100 miles north-northeast of Calgary are in the same class. The Hunt Oil case is a prime example of costly delineation, for although two excellent D3 oil wells have been completed on the discovery reef one with 114 ft. of zone and the second with 148 ft. of pay four dry holes have also been drilled in the immediate area by the discovery company.

Book Cliffs is new gas discovery in Uinta basin

Utah's Uinta basin has a new Dakota Cretaceous gas discovery at Book Cliffs. Great Yellowstone Co. completed 1 Book Cliffs unit in SE SE 32-18s-22e, Grand County, flowing 5,300 M.c.f.d. from perforations at 5,186-95 and 5,224-34 ft. Location is 9 miles southwest of Diamond Ridge field in the southeast part of the basin.

North Dakota's Renville adds new oil discovery

A new Mission Canyon Mississippian oil discovery is reported at Cardinal Petroleum, Sun Oil Co., and North American Royalties 1 Harkness, SW SE 28-164n-84w, Renville County, North Dakota.

The Williston basin discovery pumped 162 bbl. of oil daily plus 30% water from perforations at 3,990-4,014 ft. This well is a confirmation discovery to the Kissinger Petroleum Co. Madison well recently completed across the border in Saskatchewan.

Sole producer in Texas' Childress County comes in

A Cisco Pennsylvanian reef oil discovery gives Childress County at the extreme southeast corner of the Texas Panhandle its sole producer. The well is O. P. Leonard 1-A E. V. Perkins, 3½ miles southeast of Kirkland in Section 382, Block H, Waco & Northwestern Railroad Survey.

Eleven locations busy in Union Furnace, Ohio

Another good producer was hit on a west stepout of Union Furnace pool in Washington Township, Hocking County.

Ben H. Mills reported the 1 A. R. Brooks, Section 28, made 585 bbl. of oil with 750 M.c.f.d. in a 24-hour test 4 days after fracture. The Clinton sand at 2,768-91 ft. had 18 bbl. natural.

Action here is stepping up with 11 locations reported active.

Good gas well reported at Uinta basin discovery area

The west extension to Rockhouse field in Uintah County, Uinta basin, Utah, flowed 18,480 M.c.f.d. It is Shamrock Oil & Gas Corp. 4 Rockhouse unit, SE NW 9-11s-23e.

The well flowed from Wasatch Tertiary sand through perforations at 3,597-4,443 ft.

DeKalk Petroleum Co. completed the first Mesaverde gas well in Ute Trail field at 1 Ute Trail unit, C NE NE 8-10s-22e. This well flowed 4 M.M.c.f.d. from Mesaverde Cretaceous sand and 3 M.M.c.f.d. from Wasatch. This is the first Mesaverde well on the unit. The dually completed well will be shut in until Mountain Fuel Supply and Utah Natural Gas Co. complete their pipeline.

New Dakota production open in Powder River basin

The Powder River basin has a new Dakota Cretaceous oil producing area at Stuarco Oil Co. 1 George in C SW SW 27-45n-66w, Weston County, Wyoming.

The well pumped 278 bbl. of oil daily with production coming from Dakota sand perforations at 6,540-43 ft. Location of the new George Ranch field is about 2 miles northeast of Lodgepole field and 2 miles east of Lonetree Creek field.

Rozet field. A wildcat 2½ miles east of Rozet field in northeastern Powder River basin recovered 1,675 ft. of gassy oil and 375 ft. of heavily oil-cut mud in 1 hour on drill-stem test of the Muddy Cretaceous at 6,461-6,609 ft. The well is Stuarco et al. 1 Miller in C SW SE 21-50n-69w. Several locations were staked in the area following oil recovery reports.

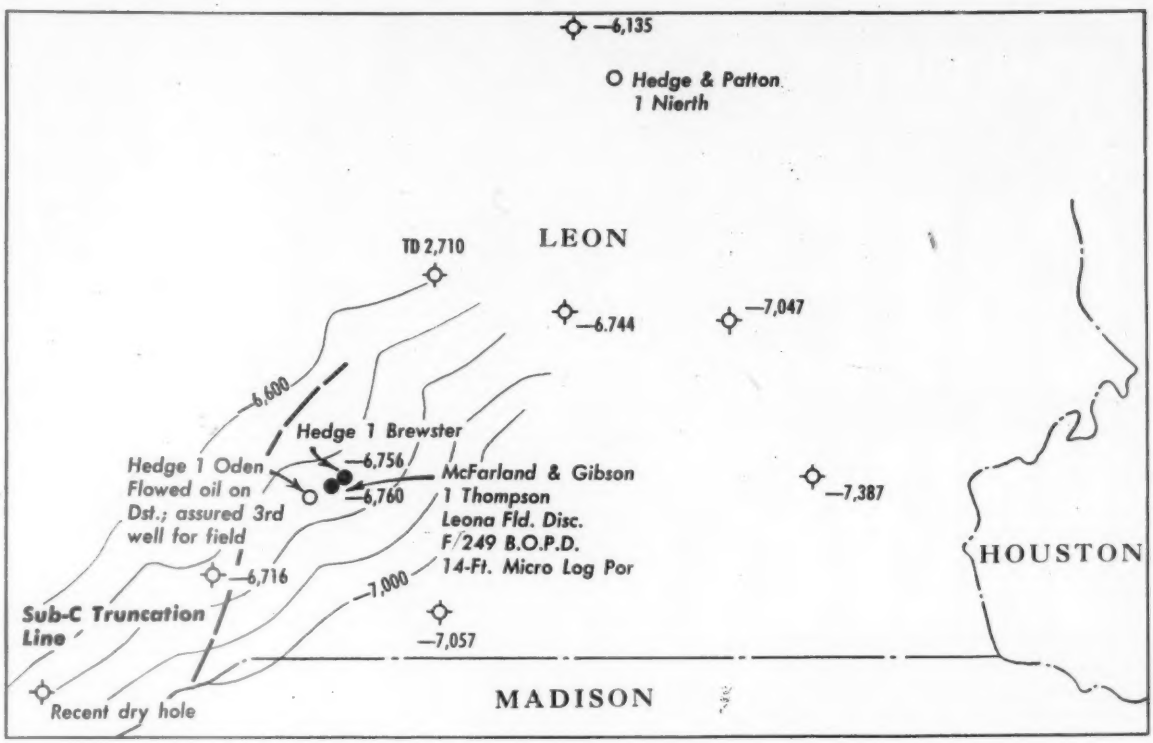
Four new names. Four new fields in Wyoming have been given names by the Wyoming Field Names Advisory Committee.

Schrader Flats was opened at Ferguson and Bosoworth 1 Batzer-Government in NW SW 26-31n-82w. This Muddy gas discovery was completed in January. Shell Oil Co. et al. opened Dinty Moore Reservoir field at Dinty Moore unit in 3-37n-92w. This was a Fort Union Tertiary gas discovery. Long Island is the name of Belco Petroleum Co.'s new 3 Long Island unit discovery in SW SW 24-29n-112w. George Ranch, a new field, is discussed above.

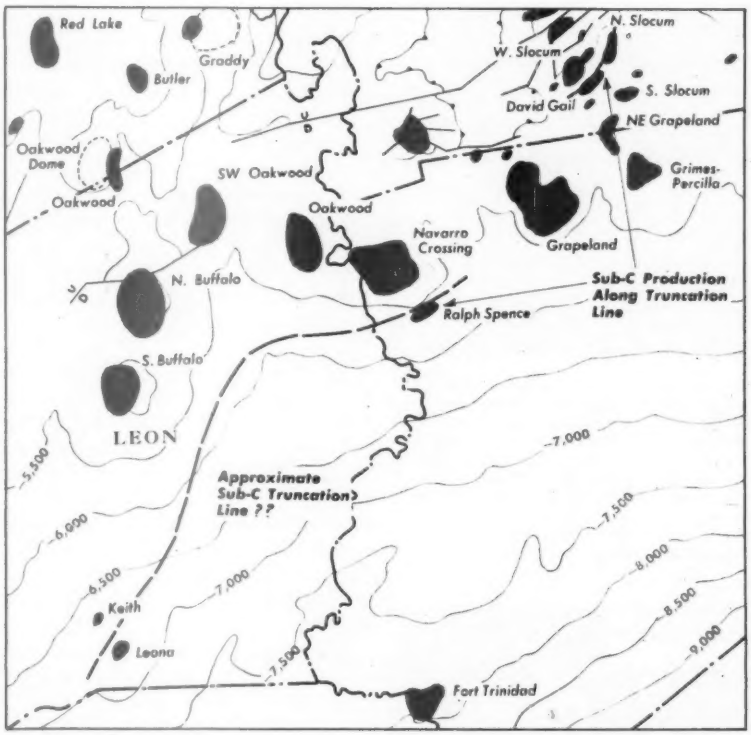
Triple discovery reported in Matagorda County, Texas coast

Triple completion is reported at Oil & Gas Property Management, Inc., 1 Trull & Pybus, Matagorda County, on the Texas Gulf Coast. The well is 3 miles southeast of Blessing in the George W. Nexsen Survey, A-65, Gaines Subdivision, Lot 11.

The well's lower tubing zone in the Frio at 8,210-20 ft. flowed 54 bbl. of oil daily through 10/64-in. choke. The middle tubing got 203 bbl. per day from 9/64-in. choke from Frio 14-B perforations at 8,185-89 ft. The upper tubing got 31 bbl. of oil per day from Frio 14-A sand perforations at 8,150-58 ft. Total daily flow is 286 bbl. Nearest production is about 1 mile east at Blessing field.



A NEW East Texas Sub-Clarksville oil field is developing in Leon County at Leona. Fig. 1.



SOME FEEL that the new Sub-Clarksville production at Leona is on the same truncation line as Ralph Spence field to the northeast. Map contoured on base of the Austin chalk. Fig. 2.

Third Texas well taps pay in Leon County

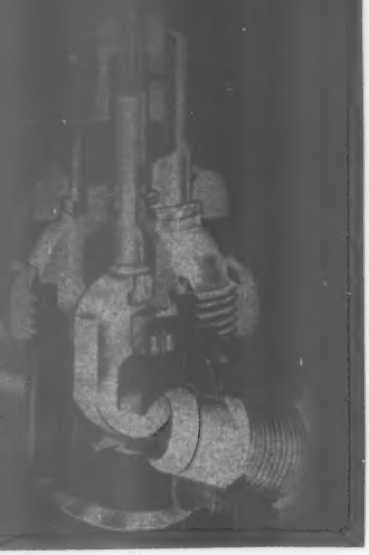
PRODUCTION is assured at a third well in a new Leon County Sub-Clarksville oil field, East Texas.

This third producer will be R. H. Hedge 1 I. M. Oden in the Alse Garrett Survey, 2,160 ft. southwest of the discovery well. Crews are testing perforations at 7,102-8 ft. The discovery well of the new field was J. W. McFarland and Gibson Drilling Co. 1 F. L. Thompson on the Alse Garrett Survey. It was completed in April flowing 249 bbl. of oil daily from perforations at 7,134-40 ft. The confirmation well. 660 ft. east, was completed recently. McFarland has moved 1,275 ft. southwest of the discovery and is below 2,088 ft. at the 2 F. L. Thompson on the same survey. This will go to 7,300 ft. for the Sub-Clarksville. Nearest such production is at Ralph Spence to the northeast and at Madisonville in Madison County to the south.

It is a little early to be certain

The DEMCO

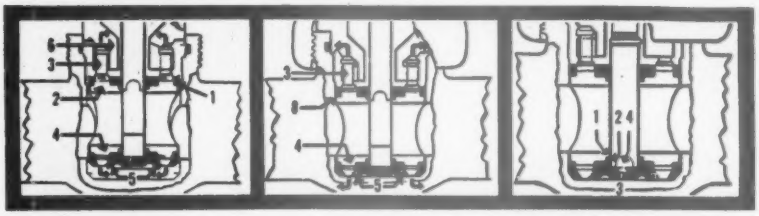
GATE VALVE



Seals DROP-TIGHT without "bumping"

Positive sealing under the highest line pressures—*with minimum torque*—makes the Demco GATE VALVE your best buy for every mud line application . . . for water flooding, hydra-frac, acidizing and cementing service . . . and for many production applications.

Demco's secret lies in its unique one-unit seal assembly, with its patented spread-ring construction. Here's how it works . . .



A. Resilient seat assembly (1) is reinforced with steel wear rings (2), having integral projecting pins at top (3) and bottom (4). In normal contracted position, the seat assembly is easily inserted in, removed from the body. Until the seat assembly is bottomed, the steel spread ring (5) does not act upon the lower projecting pins, nor do the bonnet legs (6) act upon the upper pins.

B. With the bonnet down and the seat assembly bottomed, the spread ring (5) has forced the lower projecting pins (4) outward. Similarly, the upper pins (3) have been wedged outward by the descending bonnet legs, providing a tight seal between body wall (8) and seat, preventing entrance of abrasives between seat and body wall.

C. As gate is closed, leading edge of gate slides past wear ring (1), contacts rubber ring (2) for positive rubber-to-metal seal. Seal occurs before gate touches rubber cushion (3), eliminating need for "bumping." Relief in bottom of gate (4) allows straddling of solid particles that might interfere with proper closure.

Available at supply stores everywhere in 1,000, 1,500, 2,000, 3,000 and 5,000 psi working pressures . . . in two-, three- and four-inch sizes.

DRILLING EQUIPMENT MANUFACTURING CO.

Oklahoma City, Oklahoma

DEMCO

of structural or stratigraphic relationships, but the trap appears to have been caused by updip closure against a line of truncated Sub-Clarksville sand. Production at Ralph Spence field is along this same truncated line. The Eagle Ford section is being truncated at the basal Austin unconformity. The significant factors are geographic location and the fact that the possible size of the field is wide open at this point.

Good Arbuckle well finaled in southern Oklahoma field

A flowing Arbuckle well was completed by Sinclair Oil & Gas Co. at 1 Myrtle L. Brown in NW NE NE 11-4s-3w, Northwest Hewitt field, Carter County, southern Oklahoma.

The West Spring Creek producer, an Arbuckle sand, flowed 42 bbl. in 3 hours or 336 bbl. per day on 12/64-in. choke. Production is from 3,860-90 ft., natural.

Beaver County: Across the state in the Oklahoma Panhandle, Pan American Petroleum Corp. completed a good flowing Morrow sand oil well at 3 McCune unit, SW NW 25-4n-24eCM.

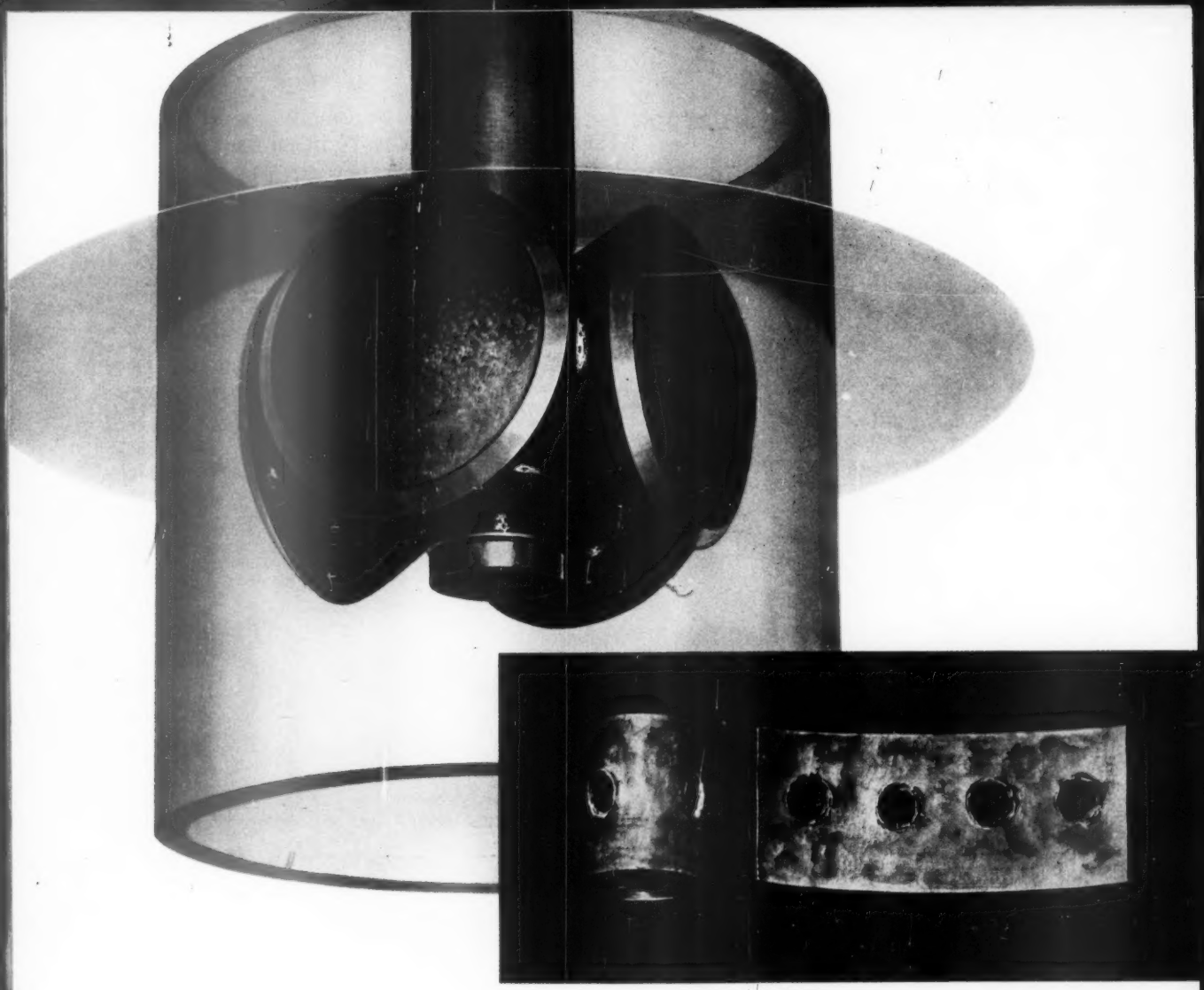
The well made 210 bbl. of 42.3°-gravity oil in 6 hours, or 840 bbl. daily through ½-in. choke. The well extends Come field ½ mile west.

Also completed was a good Morrow gas well on the northwest flank of Northeast Ivanhoe field. Pan American 1 Baldwin unit "B," C SW NE 35-2n-27eCM, flowed 2,920 M.c.f.d. from openings at 8,074-78 ft.

Texas County. Farther west in the Panhandle, Cities Service Petroleum Co. completed a Morrow Pennsylvanian oiler at 1 Bollinger "B," C SE SE 29-5n-13eCM, South Hovey field. The fell flowed 142 bbl. of oil daily from perforations at 6,176-80 ft.

Arkoma basin. In southeastern Oklahoma, Midwest Oil Corp. is still testing at a deep Red Oak wildcat on the northeast side of Brazil anticline, LeFlore County.

The 1 Goldsborough, SE SW NE 31-7n-23e, 5 miles northeast of similar gas, flowed 2,590 M.c.f.d. from 6,914-7,084 ft.



The Schlumberger Radial Jet acclaimed revolutionary by production men

Lower breakdown pressures, higher injection rates, production without stimulation . . . all have been achieved through perforations made with this fast, efficient, and economical new gun.

The Radial Jet fires a cluster of powerful shaped charges in a single plane. Depending upon the casing size, the cluster contains three, four, or five charges. Spacers permit the simultaneous shooting of several clusters as much as three feet apart.

The perforations—1″ or more in diameter—are ideal for operations requiring large, high capacity holes into the formation.

Since the holes from a cluster are made in a single plane, the gun is particularly advantageous for pinpoint fracture initiation. For the same reason, the Radial Jet is appropriate for thin zone production, treated or not.

The Radial Jet can help you make better completions at lower costs. Ask the men who have used this revolutionary new gun.

SCHLUMBERGER

THE EYES OF THE OIL INDUSTRY

Houston has a *NEW LOOK* *in banking*

Houston's new First City National Bank was designed to take the "starch" out of banking. Every person, every department is easy to see, easy to reach. A convenient escalator from the main lobby whisks you right to the door of the Oil & Gas Department. Come in and see how pleasant it is to do business in this convenient *new* bank.

the new FIRST CITY NATIONAL BANK
of houston

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

May footage account

	Field wells					Wildcats			
	Oil	Cond.	Gas	Dry	Service	Oil	Cond.	Gas	Dry
Alabama	69,006								16,402
Alaska	33,076			12,759				13,795	
Arizona				858					3,020
Arkansas	57,882		25,369	64,209					45,088
California	367,973		50,545	71,651	17,218	10,650		5,225	172,889
Colorado	31,446		49,977	110,727				7,930	107,571
Illinois	130,086			78,224	112,177	10,488			58,475
Indiana	12,574			31,400	3,224	4,133			30,091
Kansas	516,078		137,976	257,662	60,510	25,787		44,268	272,093
Kentucky	18,901		56,083	52,638	1,175				12,145
Louisiana	845,138	409,109	179,518	588,696		14,906	41,079	45,234	479,873
North	214,046	26,191	78,883	99,096		4,490	18,099	8,660	106,991
South	486,579	278,307	89,060	387,206		10,416	11,270	36,574	315,264
Offshore	144,513	104,611	11,575	102,394			11,740		57,618
Michigan	60,861		6,990	70,947	10,529	5,684		10,359	52,850
Mississippi	269,396	32,455	11,300	87,581		6,714			172,004
Montana	73,977			25,198					86,536
Nebraska	165,480			96,636		19,004			231,192
Nevada									2,681
New Mexico	416,836		187,977	81,080		27,945			103,010
West	127,271		171,211	40,060		13,971			22,553
East	289,565		16,766	41,020		13,974			80,457
New York	19,875			2,650	14,575				
North Dakota	49,676			80,102					64,083
Ohio	103,370		25,500	35,126	43,376	9,639		3,447	16,084
Oklahoma	508,298	64,238	181,805	198,979	199,808	48,523	35,577	43,683	138,522
Oregon									5,716
Pennsylvania	19,990		19,917	13,751	16,470				19,028
Tennessee								790	4,931
Texas	2,751,328	421,076	384,998	1,096,482	80,646	104,237	30,725	52,493	1,021,692
Dist. 1	50,464			19,937					110,381
Dist. 2	100,475	49,300	37,452	131,229			18,349	3,604	54,890
Dist. 3	225,490	62,546	18,988	203,353			12,376	13,000	178,871
Dist. 4	260,806	86,325	52,504	163,648	1,320	7,139			125,848
East	297,523	77,754	3,305	47,996	2,677	11,463		1,201	133,901
Dist. 7-B	178,226	31,396	28,225	158,838	7,205	14,285		4,497	110,776
West	1,151,386	51,068	30,407	140,414	35,946	40,365			252,622
Dist. 9	292,828	55,119	4,463	152,069	33,498	22,485			40,052
Dist. 10	194,130	7,568	209,654	78,998		8,500		30,191	14,351
Utah	37,396		5,410	11,992					42,155
West Virginia	13,738		193,549	42,779	2,227				
Wyoming	146,102		59,667	61,080	1,018	8,933	3,300		146,563
Total U. S.	6,718,483	926,878	1,576,581	3,173,207	562,953	296,643	110,711	227,224	3,304,694
Western Canada	356,312		43,586	43,613	5,435	39,865		25,730	96,243
Alberta	204,351		38,149	35,118	5,435	39,865		25,730	54,866
Saskatchewan	145,228			8,495					23,135
Manitoba	2,093								
British Columbia	4,640		5,437						
Northwest Territories									18,242

May completions hit year high at 4,326

State—	Total Completions											Wildcats							
	Total	Oil	Cond.	Gas	Dry	Service	Footage	Cum. wells 1961	Cum. footage 1961	Cable-tool comp.	D.D.	Total	Oil	Cond.	Gas	Dry	Footage	Cum. wells 1961	Cum. footage 1961
Alabama	8	6	0	0	2	0	85,408	28	316,059	0	0	2	0	0	0	2	16,402	6	63,193
Alaska	5	3	0	1	1	0	59,630	15	166,026	0	0	1	0	0	1	0	13,795	2	25,930
Arizona	2	0	0	0	2	0	3,878	10	19,599	0	0	1	0	0	0	1	3,020	7	16,389
Arkansas	52	18	0	4	29	1	192,548	228	846,776	0	0	12	0	0	0	12	45,088	45	176,031
California	151	100	0	8	39	4	696,151	719	3,145,739	0	15	29	1	0	1	27	188,764	118	724,044
Colorado	66	7	0	10	49	0	307,651	271	1,295,067	0	1	24	0	0	1	23	115,501	130	623,197
Florida	0	0	0	0	0	0	0	7	68,620	0	0	0	0	0	0	0	0	7	68,620
Georgia	0	0	0	0	0	0	0	1	4,500	0	0	0	0	0	0	0	0	1	4,500
Illinois	178	55	0	0	64	59	389,450	712	1,449,591	31	16	35	4	0	0	31	68,963	148	244,895
Indiana	59	13	0	0	43	3	81,422	250	355,365	28	0	23	2	0	0	21	34,224	72	95,735
Kansas	569	306	0	53	163	47	1,314,374	2,287	5,475,555	211	2	84	7	0	8	69	342,148	418	1,652,325
Kentucky	93	18	0	25	47	3	140,942	610	938,400	79	0	7	0	0	0	7	12,145	67	86,291
Louisiana	360	143	38	44	135	0	2,603,583	1,537	12,111,582	0	0	71	3	4	4	60	581,122	243	2,196,003
North	165	71	5	32	57	0	556,456	543	1,876,514	0	0	33	2	2	1	28	138,240	97	462,973
South	155	57	23	11	64	0	1,614,676	760	7,790,554	0	0	32	1	1	3	27	373,524	125	1,491,025
Offshore	40	15	10	1	14	0	432,451	234	2,444,514	0	0	6	0	1	0	5	69,358	21	242,005
Michigan	70	21	0	6	39	4	218,220	287	923,965	41	2	22	2	0	2	18	68,893	112	348,989
Mississippi	59	29	3	1	26	0	579,470	232	2,334,223	0	0	18	1	0	0	17	178,738	75	760,715
Missouri	0	0	0	0	0	0	0	22	39,219	0	0	0	0	0	0	0	0	21	37,825
Montana	37	9	0	0	22	0	185,711	155	873,756	0	1	18	0	0	0	18	86,536	71	416,812
Nebraska	116	47	0	0	69	0	512,312	403	1,826,547	0	3	54	4	0	0	50	250,196	171	815,296
Nevada	1	0	0	0	1	0	2,681	9	20,031	0	0	1	0	0	0	1	2,681	8	12,276
New Mexico	178	104	0	31	43	0	816,848	741	3,677,888	46	1	24	4	0	0	20	130,955	132	660,992
West	98	50	0	27	21	0	375,066	323	1,458,414	28	1	9	3	0	0	6	36,524	45	115,095
East	80	54	0	4	22	0	441,782	418	2,219,474	18	0	15	1	0	0	14	94,431	87	545,897
New York	28	15	0	0	2	11	37,100	152	222,356	28	0	0	0	0	0	0	0	7	24,066
North Dakota	30	10	0	0	20	0	193,861	106	657,275	0	0	9	0	0	0	9	64,083	28	202,726
Ohio	85	45	0	10	17	13	236,542	422	1,073,216	85	0	7	2	0	1	4	29,170	20	69,495
Oklahoma	467	192	9	42	121	103	1,419,433	2,462	7,922,467	109	8	45	8	3	8	26	266,305	248	1,355,553
Oregon	1	0	0	0	1	0	5,716	2	15,295	0	0	1	0	0	0	1	5,716	2	15,295
Pennsylvania	33	11	0	6	6	10	89,156	283	883,029	33	14	3	0	0	0	3	19,028	22	151,770
South Dakota	0	0	0	0	0	0	0	2	8,924	0	0	0	0	0	0	0	0	2	8,924
Tennessee	10	0	0	2	8	0	5,721	33	20,784	10	0	10	0	0	2	8	5,721	33	20,784
Texas	1,465	743	57	98	524	43	5,943,677	6,092	26,467,033	59	51	268	16	3	8	241	1,209,147	1,230	5,920,698
District 1	79	25	0	0	54	0	180,782	374	1,022,257	10	0	47	0	0	0	47	110,381	145	511,392
District 2	64	16	7	7	34	0	395,299	292	2,022,294	0	0	12	0	2	1	9	76,843	64	442,905
District 3	105	39	7	6	53	0	714,624	454	3,175,904	0	1	21	0	1	1	19	204,247	91	840,513
District 4	155	70	9	14	61	1	697,590	540	2,889,445	0	0	30	2	0	0	28	132,987	114	619,081
East (5 and 6)	126	72	13	2	38	1	575,820	496	2,391,736	0	4	32	2	0	1	29	146,565	111	528,436
District 7-B	198	77	7	9	98	7	533,448	860	2,511,341	8	5	40	3	0	2	35	129,558	227	793,931
West (7-C and 8)	361	239	6	7	94	15	1,702,208	1,514	7,529,656	11	33	68	5	0	0	63	292,987	330	1,520,019
District 9	256	153	7	1	76	19	600,514	1,017	2,503,376	30	8	12	3	0	0	9	62,537	106	358,929
District 10	121	52	1	52	16	0	543,392	545	2,421,024	0	0	6	1	0	3	2	53,042	42	305,492
Utah	16	6	0	1	9	0	96,953	109	630,184	0	0	7	0	0	0	7	42,155	45	260,547
Washington	0	0	0	0	0	0	0	5	18,650	0	0	0	0	0	0	0	0	5	18,650
West Virginia	103	7	0	80	15	1	252,293	406	989,479	103	0	0	0	0	0	0	0	2	14,737
Wisconsin	0	0	0	0	0	0	0	6	8,100	0	0	0	0	0	0	0	0	6	8,100
Wyoming	90	34	1	10	44	1	426,663	421	2,148,087	0	5	35	2	1	0	32	158,796	159	832,589
Total May	4,326	1,942	108	432	1,541	303	15,897,374	19,025	76,953,387	863	119	811	56	11	36	708	3,939,272	3,663	17,933,992
Total April	3,496	1,576	67	341	1,311	201	14,317,970	.....	.....	694	69	660	45	7	33	575	3,128,656	.....	.....
Cumulative 1961	19,025	8,626	409	1,889	6,860	1,241	76,953,367	.....	.....	3,772	484	3,663	284	45	175	3,159	17,933,972	.....	.....
Cumulative 1960	17,176	8,082	544	1,385	6,659	506	75,271,141	.....	.....	....	....	3,756	338	41	126	3,251	17,442,253	.....	.....

▸▸▸ Personals

M. W. Johnson has been named regional coordinator for Europe, the Mediterranean area and West Africa by Standard Oil Co. (N. J.). He succeeds **W. A. M. Greeven,** recently elected a Jersey director. **Ivan R. Cunningham,** vice president

JOHNSON

CUNNINGHAM

and a director of International Petroleum Co., will succeed Johnson as regional coordinator for Latin America. Johnson has been with the Jersey companies since 1928. He had been president of Esso Brasileira do Petroleo and coordinator of marketing for Jersey before becoming Latin American coordinator last year. Cunningham has been with Jersey and its affiliates since 1924. He became vice president of International Petroleum in 1955.

T. L. Satterwhite has been promoted to senior staff engineer in the central-technical division at Humble Oil & Refining Co.'s Baytown, Tex., refinery.

George L. Laird, head of the Midland, Tex., office of Robert H. Ray Co., Houston geophysical company, has been named manager of the company's new Denver office and processing center. **Clarence H. Flowers** will succeed Laird in Midland.

R. N. Cooper, vice president of Derby Refining Co. division of Colorado Oil & Gas Corp., has been named marketing coordinator in a general reorganization of Derby's marketing set up. **C. R. Worman,** retail marketing manager, has been named manager of branded sales. **S. W. Knecht** will be manager of real estate and **L. E. Poston** will be manager of refinery sales. A new policy council has been set up for sales planning. **H. D. Moore,** Derby president, is council chairman with Cooper as vice chairman. Other members are **L. M. Woodward,** vice president, and Worman, Poston, and Knecht. **J. E. McDermott** has been named southern division manager for Derby, succeeding Poston.

Ben Bloom has been named general manager of Crown Central Petroleum Corp.'s land, exploration, and production department with headquarters in Houston.

R. L. Kittle, manager of manufacturing at Shell Chemical Co.'s Torrance, Calif., plant, has been given an assignment with Shell International Chemical Co., Ltd., in London. **H. E. Hughes,** manager of Shell Chemical's new Marietta, Ohio, plant, will succeed Kittle. **G. A. White,** superintendent of operations at Marietta, will succeed Hughes there.

R. C. Hopper, Skelly Oil Co., has been elected president of the Petroleum Motor Transport Association for 1961-62. Other officers of the organization, which recommends rates for car and truck use in part-interest operations, are: **B. W. Bickel,** Oklahoma Natural Gas Co., first vice president; **Bill Edwards,** Continental Oil Co., second vice president; **Bob Nunn,** Texaco, secretary-treasurer; **E. J. Strawn,** Shell, **Rex Stiner,** D-X Sunray, and **Homer Newby,** Cities Service Oil Co., directors.

Harry J. Peckheiser, resale marketing manager for Mobil Oil Co., has been named programs manager of the programs and supply department. He will be responsible for programing and long and short-range planning. **Harry A. Bade, Jr.,** general manager of Mobil's West Coast division, will succeed Peckheiser. **Harold J. Potts,** Chicago division general manager, will succeed Bade on the West Coast. **Lambert G. Vaile,** resale sales manager of Mobil's New York City division, has been named general manager of the Chicago division.

PECKHEISER

Harold W. Torgeson, manager of Cities Service Petroleum Co.'s Ponca City, Okla., refinery, has been transferred to Cities Service Refining (Canada) as plant manager of the

TORGESON

SCROGGIN

Trafalgar, Ont., refinery. Torgeson succeeds **Vivian E. Sicks,** who has been named operations manager of PASA, Argentine petrochemical affiliate of Cities Service. **Isaac W. Scroggin,** assistant plant manager in charge of technical services at Cities Service's East Chicago, Ind., refinery, has been named to succeed Torgeson as Ponca City refinery manager. **Louis G. Brannin,** assistant plant manager, technical services, at Ponca City, will succeed Scroggin in that capacity in East Chicago. **David P. Martin,** chief mechanical engineer of the East Chicago refinery, will succeed Brannin in Ponca City.

Bill R. Payne, regional geologist for Humble's southwestern region in Houston, has been promoted to area exploration manager in Midland, Tex.

J. W. Hyde, manager of operations for Shell Chemical Co.'s industrial-chemicals division, has been named manager of the company's Houston plant. He succeeds **Glenn Purcell,** who will retire later this year. **E. S. Martin,** superintendent of the Torrance, Calif., plant, will succeed Hyde in industrial chemicals.

Dr. D. L. Yabroff, research and development manager for Shell Chemical Co.'s industrial-chemicals division in New York, has been named manager of chemical research and development at Shell Development Co.'s Emeryville, Calif., research center. He succeeds **Dr. C. L. Raymond,** who has been given an assignment in the Netherlands. **Dr. Edwin S. Gould** has joined Shell Development at Emeryville as chemist in the petroleum-chemistry department.

▶▶▶ Personals

Hamilton Rogers, executive vice president and a director of Texas Pacific Coal & Oil Co., has joined Champlin Oil & Refining Co. as executive vice president. Rogers had been with Texas Pacific since 1958. He was president and a director of Rowan Oil Co. before that time.

Ray C. Allred has been promoted to supervising research scientist in Continental Oil Co.'s central research division, Ponca City, Okla.

S. K. McCauley has been named head of crude-oil supply in Atlantic Refining Co.'s manufacturing department. **J. C. Crew** has been named manager of the product-planning department, and **W. E. Chalfant** has been named manager of the product-quality department. **K. G. Krech,** manager of crude-oil supply, and **H. M. Hancock,** manager of product control for Atlantic, will retire later this year.

ROTH

BROWN

J. E. Roth, Tidewater Oil Co. senior vice president, has assumed several special executive assignments and will more directly assist the company's president. **Charles R. Brown,** vice president and general manager of the western division, has been named a member of Tidewater's executive management and has been appointed group vice president for exploration and production activities, a new position. **James McDonald,** assistant western division general manager, has been promoted to vice president and will succeed Brown as western division general manager. Roth has been with Tidewater since 1924. He became senior vice president and a director in 1958. Roth and Brown are both former general managers of the old central division in Tulsa. Brown has been a vice president since 1948. McDonald has been with Tidewater since 1937. He was manufacturing manager before becoming assistant western division manager in 1959.

McDONALD

J. W. Hancock, general superintendent of exploration for Natural Gas Pipeline Co. of America, **J. I. Poole,** manager of rates, and **H. R. Rohwedder,** director of operations, have been elected assistant vice presidents. Hancock is headquartered in Amarillo, Tex., Poole and Rohwedder in Chicago.

Allen D. Dorris, superintendent, administration, in the transportation division of Sohio Pipe Line Co.'s supply and transportation department, has been elected vice president and a director. **Oakley M. Turner,** general superintendent of the transportation division's southwestern and tri-state regions, has been elected vice president. **Walter A. Terpenning,** administrative group supervisor, has been named treasurer of the company.

Marvin L. Mills, gager with Mid-America Pipeline Co., has been transferred to McPherson, Kans., from Liberal, Kans.

Forrest A. Ryan, laboratory technician for El Paso Natural Gas Co. at the Opal, Wyo., gasoline plant, has been promoted to main line dispatcher in Salt Lake City.

H. B. Douglas, Seattle, has been named manager of Richfield Oil Corp.'s southern division. He succeeds **S. H. Green,** who has been assigned to the Los Angeles headquarters marketing staff.

C. O. MacLeod, northern division marketing manager for Continental Oil Co.'s Rocky Mountain region in Denver, has been named coordinator of sales programs in the Houston headquarters marketing department.

William D. Owens, division engineer for Union Oil Co. in Midland, Tex., has been promoted to chief production engineer with headquarters in Los Angeles.

George L. Roller, geologist in Pan American Petroleum Corp.'s New Orleans office, has joined Van Dyke & Mejlaender, Houston independent firm, as specialist in the geology of Southeast Louisiana. The company plans to extend its operations into this area.

J. J. Nemeth has been promoted to director of West Coast sales for Continental Oil Co. Nemeth was sales promotion manager in Houston before his appointment to the new post. He will headquarter in Los Angeles.

Paul J. Wolfe has been named planning manager, a new position with Mobil International Oil Co. Wolfe has been with the Socony Mobil Oil companies since 1942 when he joined the Beaumont, Tex., refinery as process engineer. He moved to New York in 1948 and has held posts there as supervisor in manufacturing, manager of operations for the manufacturing department, and manager of the operations-analysis department.

V. R. Bruns, assistant chief chemist in the copolymer laboratory of Shell Chemical Co.'s Torrance, Calif., plant, has been assigned to the technical-service laboratory there as assistant manager. **D. F. Hess,** chemist, has been named acting chief chemist in the copolymer laboratory.

Harold G. Osborn, senior vice president and a director of Continental Oil Co., has retired. Osborn joined Conoco in 1921. He became a vice president in 1946 and a director in 1954. He has been senior vice president in Houston since 1956. Osborn will continue for a time as a director of Conoco and chairman of Continental Carbon Co. and Petroquimica Argentina SA, Conoco affiliates.

William K. Whiteford, chairman of Gulf Oil Corp., has been named chairman of Warren Petroleum Corp. to succeed **W. K. Warren.**

WHITEFORD

WARREN

The action was taken June 7 at a meeting of Warren directors but not disclosed until last week. Warren will continue as a director of Warren Petroleum and of Warren International Corp. and will remain as chairman of Transwestern Pipeline Co. He also is a director and member of the executive committee of Gulf Oil Corp. Warren founded Warren Petroleum in 1922 and has been its chief executive ever since. Gulf bought Warren Petroleum in 1955, and the merger was completed in March of 1956. **James E. Allison** will continue as president of Warren.

Jim Morren has joined Murphy Oil Co. of Oklahoma as district geologist in Corpus Christi, Tex. Morren was with Pan American Petroleum Corp. and Childs Drilling Co. before joining Murphy.

Gilbert L. Kutchins has been named senior geologist for Sinclair Oil & Gas Co. in Casper, Wyo. He has been with Sinclair since 1955.

New appointments made in Atlantic Refining Co.'s eastern region include **R. C. Mock,** regional land man; **G. T. Pyle,** associate regional geologist; **H. F. Dodson,** regional geophysicist; **A. V. Krukiel,** regional engineer; **R. R. Hawthorne,** regional gas-sales coordinator; and **J. M. Bickford,** administrative assistant. In other changes resulting from reorganization of Atlantic's domestic producing department, **George V. Ricks** has been named head of drilling and production activities in the Mid-Continent district. **Jack N. Clark** has been named land man for this district with **Henry A. Campo** as district geologist and **K. V. Terrell** as district engineer. In the Southwest Texas district, **B. G. Hubner** has been named district geophysicist; **Henry H. Wagner** will be district land man; **Robert O. McGinnis,** district geologist; **Ivan Tucker,** drilling and production superintendent; **B. F. Thomas,** district drilling supervisor; and **L. K. Williams,** district engineer. In the north Permian district, new appointments include **R. N. Watson,** district geologist; **R. M. Parks,** district land man; **C. E. Cardwell, Jr.,** drilling and production superintendent; **Bruce Vernor,** district engineer; and **R. J. Knott,** district geophysicist.

▶▶▶ Personals

Hoover L. Gibson, superintendent of compressor engineering for Texas Gas Transmission Corp., has been named superintendent of design and construction. He will be responsible for design and construction of all compressor station and pipeline facilities. Gibson has been with Texas Gas since 1948 and has been superintendent of compressor engineering since 1957.

Edward A. Gribi, Jr., formerly with Westates Petroleum Co. in Los Angeles, has opened offices as geological consultant in King City, Calif.

Dr. C. D. Gordon has been promoted to senior research chemist in the petroleum-products research section of California Research Corp.'s Richmond, Calif., laboratory.

E. E. Young, chief engineer for the production department of Sohio Petroleum Co. in Oklahoma City, has been transferred to Cleveland

(Personals continued on Page 266)

▶▶▶ Deaths

Charles Louis Rowan, 70, Fort Worth oil producer and drilling contractor, died June 12 in a Fort Worth hospital. Rowan was chairman of Rowan Drilling Co. and was a director of Rowan Oil Co. when it was sold to Texas Pacific Coal & Oil Co. in 1958. He was associated with his brother, Arch Rowan, in the oil ventures. The brothers formed Rowan Drilling in 1924 and Rowan Oil in 1948.

Dr. Albert N. Murray, 66, retired head of the University of Tulsa's geology department, died June 18 at his home in Tulsa after a heart attack. Dr. Murray came to Tulsa in 1928 to head the geology department in the university's new school of petroleum engineering. He retired last year. He was a past president of Oklahoma Academy of Science and of Tulsa Geological Society.

J. J. Willenburg, 62, superintendent of Service Pipe Line Co.'s Missouri-Illinois division in Galesburg, Ill., died June 15 in a Galesburg hospital after a heart attack. Willenburg had been with Service Pipe Line since 1922.

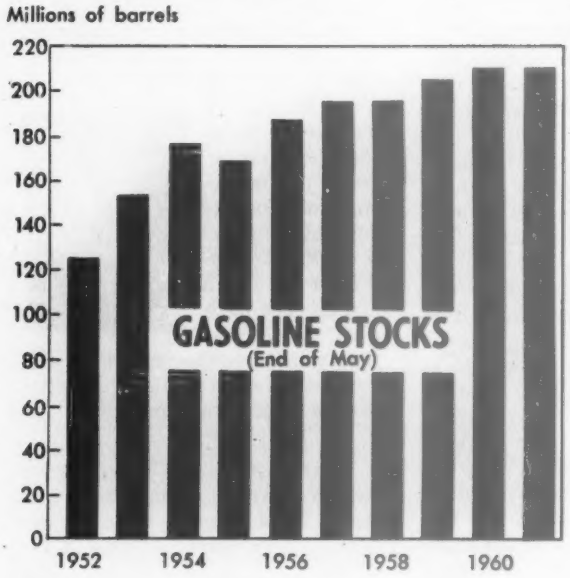
Arleigh Burrow Lynn, Jr., 34, petroleum engineer with Earlougher Engineering Co., Tulsa consulting firm, died June 17 at his home in Tulsa after a heart attack.

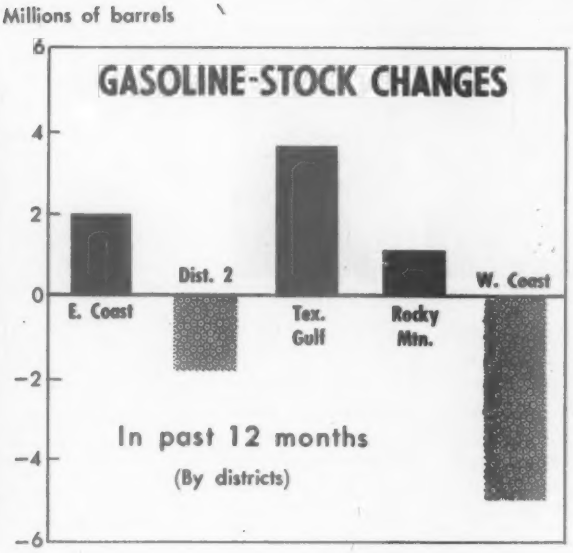
George P. Livermore, 57, Lubbock, Tex., drilling contractor, was killed June 11 in an auto accident near Guthrie, Tex. His company drilled the first producing well in Chile in 1945. In U. S. operations, the company was active in West Texas, New Mexico, Oklahoma, Colorado, and Utah. Livermore was a past vice president of American Association of Oilwell Drilling Contractors.

H. Keith Erickson, 44, United States Geological Survey division chief in Denver, died June 12 after a short illness.

James S. Cavanaugh, 83, who retired in 1952 as a superintendent at the Oil City, Pa., refinery of Pennzoil division of South Penn Oil Co., died June 13 at his home in Rouseville, Pa.

Walter O. Glore, 55, Tulsa independent operator, died June 18 in a Tulsa hospital.





Gulf Coast gasoline stocks are up

BY JOHN C. CASPER

FOR THE PAST 10 years, refiners have been building gasoline inventories faster than customers have been increasing purchases.

Here is the record back to 1951. In that year the Bureau of Mines expanded its stock coverage to include many terminals not previously reporting to the bureau.

On this new basis, the average month-end gasoline stock for 1951 was 134.5 million barrels. Total demand averaged 3.1 million barrels daily. For the year as a whole, primary gasoline inventories represented 43.3 days' supply. The average dropped to 40.7 days the following year.

Average gasoline-stock totals last year were 88.2 times daily average gasoline demand. For the past 4 years, stocks have represented almost 48 days' supply.

If this extra product is needed for a smooth flow of gasoline from refiner to customer, then the net additional cost of storage and loss must be covered either by higher prices or a reduction in refiner and marketer profit.

The left chart shows gasoline inventories at the end of May each year since 1952. Bars indicate an almost steady rise from 1952 through 1959. The increase for 1960 was small, and current reports show practically no increase for 1961. But, there were wide variations in stock changes by districts.

Reports for June 9 showed East Coast gasoline stocks up 2 million barrels from a year ago. District 2 had an over-all reduction of 1.9 million barrels with most of the decrease in the Mid-Continent refining district. There was a small gain in Appalachian 2.

The Gulf Coast area had an increase of 3.7 million barrels, with all of the gain in the coastal area of Texas. Louisiana refiners reported a small reduction.

Extra gasoline on the East Coast will be valuable if the Maritime strike cuts supply, but every extra barrel on the Gulf Coast adds to the storage problem as long as tanker shipments to the East Coast are held up. A long strike would force reductions in Gulf Coast refinery runs and add to crude inventories. High crude stocks would force a reduction in crude production.

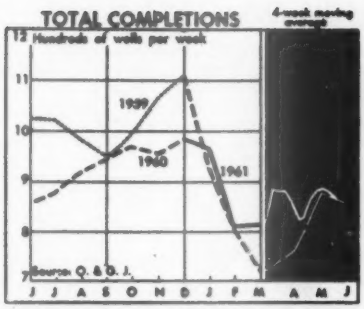
The big gasoline-stock drop this year is on the West Coast. Refiners in this area report only 26.8 million barrels compared with 31.8 million a year ago, a net reduction of 5 million barrels.

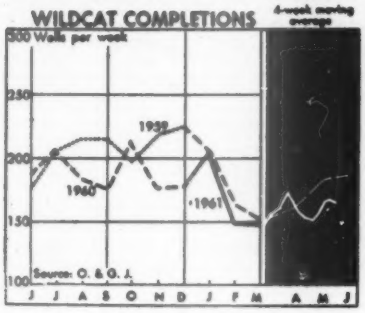
A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,091,250	UP	32,565	UP	129,956
Crude stocks	256,909,000	DOWN	446,000	DOWN	1,994,000
Completions	950	UP	161	UP	80
Refinery runs	8,224,000	UP	52,000	UP	190,000
Gasoline stocks	207,682,000	DOWN	1,143,000	UP	3,310,000
Kerosine stocks	29,211,000	UP	617,000	UP	2,328,000
Distillate stocks	102,666,000	UP	2,954,000	DOWN	379,000
Residual stocks	45,175,000	UP	26,000	UP	5,296,000
Four-product stocks	384,734,000	UP	2,454,000	UP	10,555,000
Total imports	1,505,200	DOWN	201,600	DOWN	8,300

Active Rotary Rigs

DRILLING





	6-19-61	6-12-61	6-20-60
Alabama	3	3	5
Alaska	10	10	4
Arkansas	13	11	12
Arizona	2	2	1
California	66	74	80
Land	61	68	75
Offshore	5	6	5
Colorado	34	31	25
Florida	0	0	2
Land	0	0	2
Offshore	0	0	0
Georgia	1	2	0
Illinois	41	39	39
Indiana	8	11	7
Iowa	1	1	0
Kansas	107	100	93
Kentucky	4	5	7
Louisiana	287	293	296
North	27	31	43
S. Inland waters	110	115	107
S. Land	90	88	91
Offshore	60	59	55
Michigan	29	21	47
Mississippi	61	61	58
Missouri	2	2	2
Montana	24	24	21
Nebraska	37	37	24
New Mexico	103	107	124

	6-19-61	6-12-61	6-20-60
New York	1	0	0
North Dakota	16	22	18
Ohio	6	6	7
Oklahoma	193	189	180
Pennsylvania	7	7	12
South Dakota	1	1	0
Texas	655	636	602
S. Inland waters	6	6	4
S. Land	187	180	171
Offshore	7	3	1
Nort.	60	59	55
Panhandle	49	49	41
East	76	80	64
West Central	161	156	166
West	109	103	100
Utah	26	23	31
Virginia	1	1	0
Washington	1	1	0
West Virginia	1	6	6
Wyoming	55	49	57
Total U. S.	1,802	1,775	1,760
Cum. avg. to date	1,644	1,637	1,738
Western Canada	163	155	165
Eastern Canada	1	1	2
Grand total	1,966	1,931	1,927

Hughes Tool Co. report.

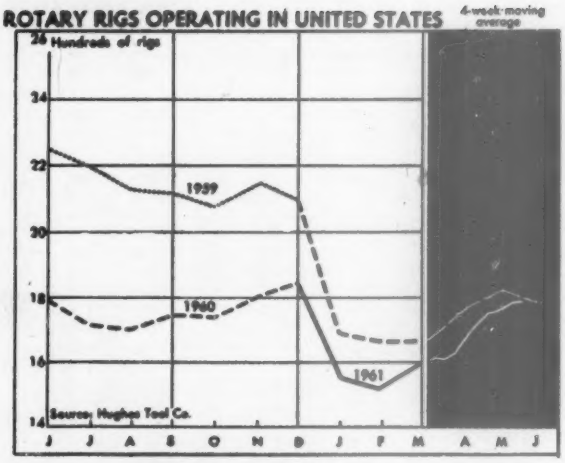
WEEKLY WELL COMPLETIONS . . . WEEK ENDED JUNE 17, 1961

	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1961	1960	Total	Crude	Cond.	Gas	Dry	1961	1960
Alabama	1	1	0	0	0	0	3,107	29	23	0	0	0	0	0	6	1
Alaska	1	1	0	0	0	0	20,775	18	.....	0	0	0	0	0	2	.....
Appalachian*	49	13	0	20	6	10	125,114	963	753	3	0	0	0	3	29	22
Arizona	1	0	0	1	0	0	1,372	12	8	0	0	0	0	0	7	8
Arkansas	5	0	0	1	4	0	18,097	237	281	0	0	0	0	0	45	74
California	33	23	0	0	10	0	157,990	784	668	3	0	0	0	3	128	137
Colorado	7	1	0	1	5	0	40,975	289	286	6	1	0	0	5	141	134
Illinois	26	10	0	0	16	0	55,788	811	899	9	1	0	0	8	160	208
Indiana	25	7	0	0	17	1	33,295	286	435	4	0	0	0	8	84	168
Kansas	87	48	0	10	17	12	194,650	2,451	1,508	16	5	0	0	11	448	496
Kentucky	16	5	0	0	11	0	18,994	657	743	2	0	0	0	2	76	87
Louisiana	107	49	7	3	48	0	825,034	1,692	1,558	16	1	0	1	14	266	230
North	39	20	0	2	17	0	121,318	612	517	6	1	0	1	4	108	101
South	48	21	6	0	21	0	497,051	824	793	5	0	0	0	5	132	113
Offshore	20	8	1	1	10	0	206,665	256	248	5	0	0	0	5	26	16
Michigan	0	0	0	0	0	0	0	304	350	0	0	0	0	0	120	107
Mississippi	7	3	1	0	3	0	75,094	255	342	1	0	0	0	1	82	118
Montana	4	4	0	0	0	0	15,048	165	129	0	0	0	0	0	75	58
Nebraska	28	10	0	0	18	0	120,373	444	370	13	1	0	0	12	191	144
New Mexico	30	12	1	9	8	6	200,242	812	851	6	0	1	1	4	144	120
West	18	6	1	8	3	0	96,455	355	272	3	0	1	0	2	50	24
East	18	6	0	1	5	6	103,787	457	579	3	0	0	1	2	94	96
North Dakota	3	1	0	0	2	0	21,879	115	142	1	0	0	0	1	31	32
Ohio	29	17	0	8	4	0	92,375	472	456	1	0	0	0	1	21	26
Oklahoma	181	87	0	11	56	27	524,696	2,705	1,791	19	3	0	4	12	278	353
Texas	284	141	17	8	115	3	1,272,336	6,658	7,429	64	6	1	1	56	1,340	1,491
Dist. 1	20	9	1	0	10	0	66,491	408	513	5	0	0	0	5	154	189
Dist. 2	13	2	2	1	8	0	91,636	319	360	5	0	1	0	4	71	87
Dist. 3	33	17	3	1	12	0	188,527	500	577	7	1	0	0	6	99	107
Dist. 4	18	7	1	0	10	0	105,229	582	510	6	0	0	0	6	123	150
East	26	7	0	0	19	0	118,685	566	575	16	0	0	0	16	132	120
Dist. 7-B	33	14	3	0	16	0	88,617	928	1,088	8	1	0	0	7	246	304
West	67	42	3	0	21	1	340,093	1,658	1,969	12	2	0	0	10	356	307
Dist. 9	52	32	3	0	15	2	147,805	1,115	1,369	4	2	0	0	2	115	198
Dist. 10	22	11	1	6	4	0	125,453	582	468	1	0	0	1	0	44	29
Utah	5	3	0	1	1	0	28,086	117	128	1	0	0	0	1	47	44
Wyoming	13	5	0	2	6	0	73,778	444	457	6	0	0	1	5	168	198
Misc. (Nev.)	2	0	0	0	2	0	1,617	100	67	2	0	0	0	2	94	52
Total U. S.	950	441	26	75	349	59	3,911,015	20,820	19,674	173	18	2	8	145	3,983	4,308
Previous week	789	334	18	69	271	97	3,159,731	.....	.....	150	18	0	5	127	.....	.....
Cum. 1961	20,820	9,459	463	2,008	7,481	1,409	83,977,197	.....	.....	3,983	319	48	185	3,431	.....	.....
Cum. 1960	19,674	9,296	623	1,572	7,637	546	86,377,786	.....	.....	4,308	390	47	141	3,730	.....	.....
Western Canada	43	25	0	5	12	1	206,989	959	958	6	0	0	2	4	274	279

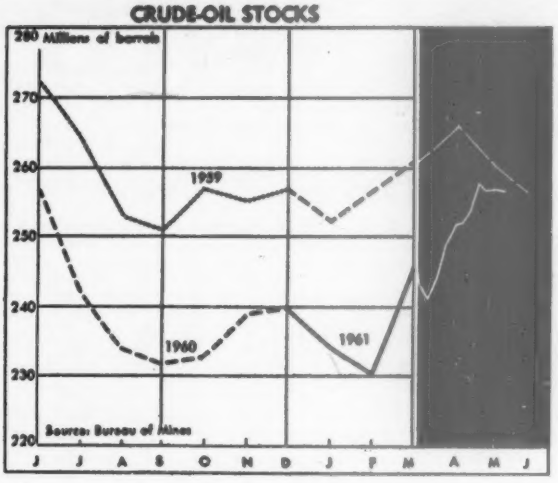
*Incl. West Virginia 16.

PRODUCTION

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	6-10-61	6-3-61	6-11-60
Pennsylvania	2,381	2,363	2,118
Other Appalachian	1,680	1,684	1,744
Illinois, Indiana, Michigan	10,376	10,332	10,272
Nebraska and North Dakota	3,095	3,054	2,556
Kansas	10,032	9,659	9,616
Oklahoma	16,549	16,924	18,211
Arkansas	2,143	1,869	1,873
Louisiana	21,210	21,397	19,346
North	3,527	3,405	3,452
South	17,683	17,992	15,894
Mississippi, Alabama, Florida	2,357	2,279	2,181
New Mexico	8,052	7,957	8,049
Texas	107,537	109,248	108,737
East Texas	9,470	9,228	8,558
West Texas	47,675	47,638	49,991
Texas Gulf	19,654	20,116	19,061
Other Texas	30,738	32,266	31,127
Wyoming	19,507	19,495	18,119
Other Rocky Mountain	9,785	9,971	10,388
California	25,395	24,705	28,877
Foreign	†16,810	16,418	16,816
Total	256,909	257,355	258,903

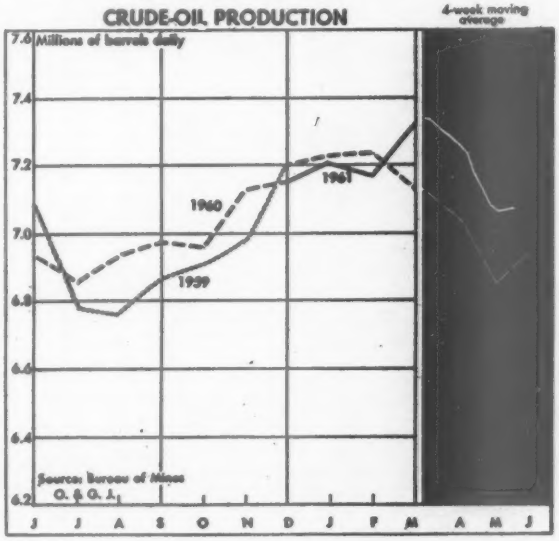
*Bureau of Mines. †Includes 4,313,000 bbl. in California.

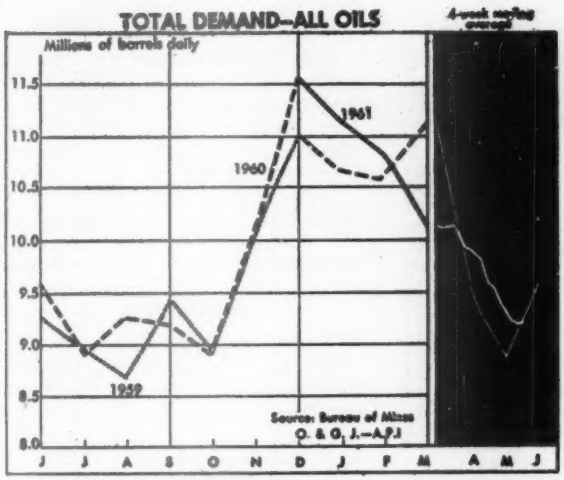
DAILY AVERAGE PRODUCTION FOR WEEK

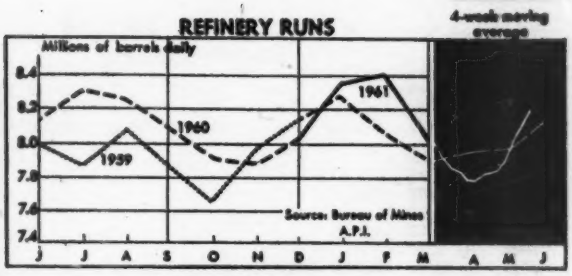
	June 17, 1961 Crude oil	Lease condensate	Total	June 10 total
Alabama	19,300	.....	19,300	19,235
Alaska	14,500	.....	14,500	14,300
Arkansas	80,900	125	81,025	80,950
California	822,500	.....	822,500	824,400
Colorado	129,200	.....	129,200	129,000
Eastern	37,900	.....	37,900	39,800
Florida	1,050	.....	1,050	1,050
Illinois	217,800	.....	217,800	212,100
Indiana	31,000	.....	31,000	31,000
Kansas	†305,250	.....	†305,250	†291,800
Kentucky	49,300	.....	49,300	49,200
Louisiana	1,026,000	133,800	1,159,800	1,159,675
North	105,000	5,300	110,300	110,175
South	921,000	128,500	1,049,500	1,049,500
Michigan	50,800	.....	50,800	52,300
Mississippi	146,200	3,700	149,900	149,900
Montana	82,900	.....	82,900	81,700
Nebraska	70,100	.....	70,100	66,900
Nevada	450	.....	450	450
New Mexico	308,000	6,800	314,800	314,800
North Dakota	51,000	.....	51,000	53,800
Oklahoma	†511,200	.....	†511,200	†495,000
Texas	2,410,000	89,600	2,499,600	2,499,600
Dist. 1	43,000	2,300	45,300	45,300
Dist. 2	99,000	8,100	107,100	107,100
Dist. 3	309,000	37,000	346,000	346,000
Dist. 4	175,000	12,500	187,500	187,500
Dist. 5	26,000	500	26,500	26,500
Dist. 6	106,000	8,200	114,200	114,200
East Texas field	128,000	.....	128,000	128,000
Dist. 7-B	121,000	250	121,250	121,250
Dist. 7-C	110,000	3,150	113,150	113,150
Dist. 8	997,000	12,000	1,009,000	1,009,000
Dist. 9	193,000	3,400	196,400	196,400
Dist. 10	103,000	2,200	105,200	105,200
Utah	98,500	.....	98,500	98,500
Wyoming	392,600	.....	392,600	393,000
Others	‡775	.....	‡775	‡725
Total U. S.	6,857,225	234,025	7,091,250	7,058,685
Change from prev. week, up		.....	32,565	.....
Canada	†626,200	.....	†626,200	†552,000
Total U. S. Prod.—Jan. 1-June 17			1,216,425,400 bbl.	
Same period last year (crude plus cond.)			*1,196,436,100 bbl.	

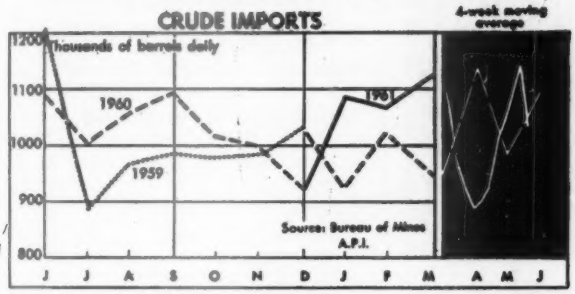
*Includes 39,173,800 bbl. condensate. †Week ended previous Monday. ‡South Dakota and Arizona.

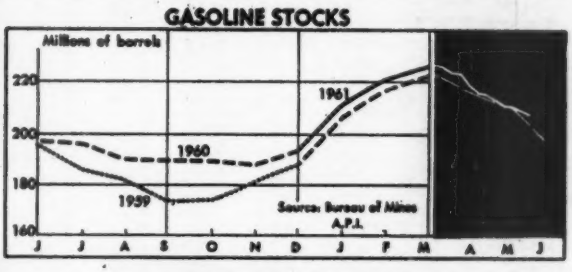
CRUDE-OIL PRODUCTION

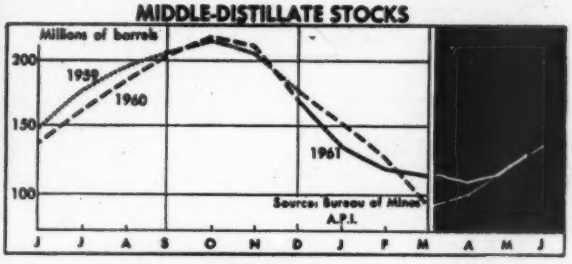


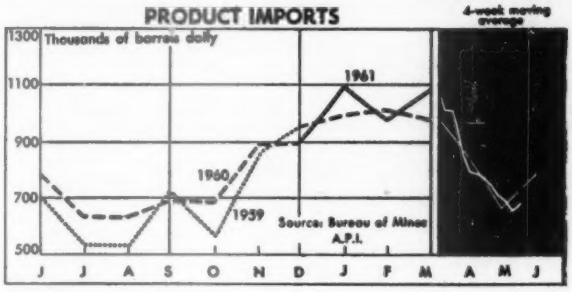


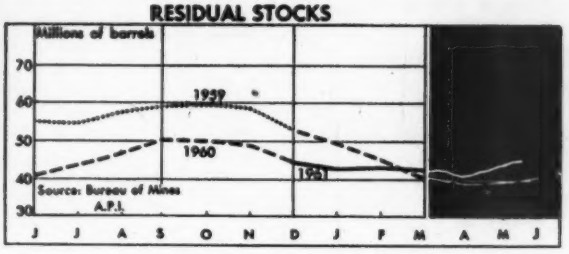












API REFINERY REPORT, June 16, 1961

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, June 1960—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,166	540.3	37.0	289.7	142.8	49,955	11,010	30,769	11,305	1,128	528.9	34.2	325.7	146.4
Appalachian:														
District 1	100	41.6	1.1	26.9	7.0	5,811	631	2,318	366	96	41.2	2.7	21.7	7.7
District 2	89	41.0	4.7	9.1	9.6	2,998	365	1,108	228	90	46.6	2.1	13.6	8.5
Ind., Ill., Ky.	1,471	769.6	67.4	314.0	139.3	36,093	4,989	17,576	5,369	1,455	774.4	66.7	301.8	128.0
Minn., Wis., Dak.	133	65.4	3.3	36.4	17.0	6,792	922	4,226	674	128	62.3	5.3	32.8	14.6
Okla., Kans., Mo.	755	436.1	20.7	186.0	23.0	18,310	1,447	9,949	964	751	422.7	17.5	175.7	21.0
Inland Texas	316	246.0	12.6	65.1	20.1	7,542	560	1,607	2,651	304	223.5	10.0	49.8	22.4
Texas Gulf Coast	1,879	1,046.9	98.1	483.1	113.9	29,125	3,685	12,892	4,419	1,967	1,007.0	95.5	462.6	141.8
La. Gulf Coast	707	401.3	41.3	160.7	48.3	11,148	3,009	5,098	1,313	653	329.2	45.0	136.5	41.6
N. La. and Ark.	111	62.4	4.6	28.0	6.1	5,388	565	1,818	116	112	64.5	4.9	24.4	5.6
Rocky Mountain:														
New Mexico	24	12.3	0.7	4.7	2.0	789	53	177	9	24	13.2	0.3	4.3	2.2
Other Rocky Mt.	289	139.4	3.1	59.9	33.3	7,531	507	2,562	963	275	132.9	3.7	63.2	27.8
West Coast	1,184	585.4	36.1	157.1	269.6	26,200	1,468	12,566	16,798	1,143	513.7	37.4	163.2	275.7
June 16, 1961	8,224	4,387.7	330.7	1,820.7	832.0	207,682	29,211	102,666	45,175	8,126	4,160.1	325.3	1,778.0	843.3
June 9, 1961	8,172	4,226.6	337.1	1,776.3	841.9	208,825	28,594	99,712	45,149	.....	.....	.....	.....	.....
June 17, 1960	8,034	4,211.7	379.9	1,790.1	868.1	204,372	26,883	103,045	39,879	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Oklahoma	West Tex. (sour)	West Tex. (Inter.)	No.* Texas	Texas Refugio Light	Bayou Sale (La.)	Denver Julesburg	Wyo. (sour)
14-14.9	$1.86	....	....	....	....	....	....	....	....
15-15.9	1.93	....	....	....	....	....	....	....	$1.81
16-16.9	2.00	....	....	....	....	....	....	....	1.86
17-17.9	2.06	....	....	....	....	....	....	....	1.91
18-18.9	2.13	....	....	....	....	....	....	....	1.96
19-19.9	2.20	....	(†)	....	....	....	....	....	2.01
20-20.9	2.27	$2.49	$2.35	$2.61	$2.29	$2.95	$2.90	$2.58	2.06
21-21.9	2.33	2.52	2.38	2.63	2.33	2.97	2.92	2.60	2.11
22-22.9	2.40	2.55	2.41	2.65	2.37	2.99	2.94	2.62	2.16
23-23.9	2.46	2.58	2.44	2.67	2.41	3.01	2.96	2.64	2.21
24-24.9	2.53	2.61	2.47	2.69	2.45	3.03	2.98	2.66	2.26
25-25.9	2.60	2.64	2.50	2.71	2.49	3.05	3.00	2.68	2.31
26-26.9	2.67	2.67	2.53	2.73	2.53	3.07	3.02	2.70	2.36
27-27.9	2.74	2.70	2.56	2.75	2.57	3.09	3.04	2.72	2.49
28-28.9	2.81	2.73	2.59	2.77	2.61	3.11	3.06	2.74	2.54
29-29.9	2.87	2.76	2.62	2.79	2.65	3.13	3.08	2.76	2.59
30-30.9	2.93	2.79	2.65	2.81	2.69	3.15	3.10	2.78	2.63
31-31.9	3.00	2.82	2.68	2.83	2.73	3.17	3.12	2.80	2.67
32-32.9	3.06	2.85	2.71	2.85	2.77	3.19	3.14	2.82	2.71
33-33.9	3.12	2.88	2.74	2.87	2.81	3.21	3.16	2.84	2.75
34-34.9	3.17	2.91	2.77	2.89	2.85	3.23	3.18	2.86	2.79
35-35.9	3.22	2.94	2.80	2.91	2.89	3.25	3.20	2.88	2.83
36-36.9	3.27	2.97	2.83	2.93	2.93	3.27	3.22	2.90	2.87
37-37.9	3.31	2.99	2.86	2.95	2.95	3.29	3.24	2.92	2.89
38-38.9	....	3.01	2.89	2.97	2.97	3.31	3.26	2.94	2.91
39-39.9	....	3.03	2.92	2.99	2.99	3.33	3.28	2.96	2.93
40-44.9	....	3.05	2.95	3.01	3.01	3.35	3.30	2.98	2.95

*Cooke, Grayson, Montague. †Two buyers announced increase.

FLAT PRICES

Louisiana:	
Sweet Lake	$3.00
Texas:	
East Texas	3.05-3.25
Conroe	3.23-3.53
Van	3.08
Pennsylvania Grade:	
Bradford	$4.80
Middle District	4.52
Southwest Pennsylvania	4.25
West Virginia	4.17
Buckeye Grade	4.08
Illinois Basin	3.00-3.05

FOREIGN

Middle East, Persian Gulf: (cargoes f.o.b. lifting port)	
Arabian, 34.0°-34.9°, Ras Tanura	$1.80
Iranian, 34.0°-34.9°, Bandar Mashur	1.78
Iranian, 34.0°-34.9°, Abadan	1.73
Iraq, 35.0°-35.9°, Fao	1.72
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.59
Qatar, 41.0°-41.9°, Umm said	1.95
Middle East, E. Mediterranean:	
Arabian, 34.0°-34.9°, Sidon	$2.17
Iraq, Mosul-Kirkuk, 35.0°-35.9°, Tripoli	2.19
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 36°	2.42
Canada:	
Leduc-Woodbend	$2.53
Redwater (Alta.)	2.42
Weyburn (light)	2.075
Midale C	1.70
Venezuela:	
Cumarebo, 47°-47.9°, Tucupido	3.34
San Joaquin, 40°-40.9°, Puerto La Cruz	3.08
Oficina, 35°-35.9°, Puerto La Cruz	2.80
Tia Juana medium, 26°-26.9°, Amuay*	2.30
Quiriquire, 16.0°-16.4°, Caripito	2.10
Lagunillas heavy, flat, Las Piedras*	2.10
Bachaquero, flat, 15°-16°, Las Piedras*	1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

TANKER RATES (Long Ton)

(Latest reported spot fixtures)

★ Carib.-UK, dirty (Scale—60%) (13s. 0d.)	$1.82
★ Carib.-Cal., dirty (ATRS—72.5%)	1.49
★ PG-Cal., dirty (USMC—80%)	3.37
★ PG-NY, dirty (USMC—72.5%)	3.49
PG-Japan, dirty (USMC—77.5%)	2.30

★Denotes change from previous week.

REFINED PRODUCTS

Following quotations are realistic spot prices for refined products moving interstate on Wednesday each week. They may differ from refiners' posted prices and should not be considered as postings.

Light-product prices are in cents per gallon. Residual and crude prices are dollars per barrel. Crude prices are at the well unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (91 octane)	12.25-12.50
Premium (99 octane)	15.00-15.25
Natural gasoline (26-70)	4.5
Breckenridge	4.0
Gulf Coast (cargoes for coastwise or export movements):	
★ Regular (90 octane)	10.75-11.00
★ Regular (92 octane)	11.00-11.25
★ Premium (98 octane)	12.00-12.25
California (rack) Los Angeles:	
Regular (90 octane)	11.60
Premium (94 octane)	12.60
Premium (100 octane)	14.10
Caribbean area (cargoes):	
Regular (87 octane)	9.125
Premium (97 octane)	11.50

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.50-9.75
Diesel oil (58 d.i. and above)	9.00-9.25
Distillate No. 1	9.00-9.25
Distillate No. 2	8.25-8.50
Gulf Coast (cargoes):	
Kerosine 41-43	9.00
Distillate No. 2	8.25
New York Harbor (barges):	
Kerosine 42-43	*11.40
Distillate No. 2	*10.40
Diesel fuel, 48-52 d.i.	*10.55
Caribbean area (cargoes):	
Distillate No. 2	8.625

*Subject to 0.5 cent discount.

RESIDUAL FUEL (Bbl.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.65-1.75
Gulf Coast (cargoes):	
★ Bunker C fuel	2.20-2.30
New York Harbor (barges):	
Bunker C fuel	2.52
Caribbean (cargoes):	
Bunker C fuel	2.00
California (rack):	
Bunker C fuel, Los Angeles	2.25

Classified Advertising

. . . your market place for the oil and gas industry

RATES:

- **UNDISPLAYED CLASSIFIED:** 30c a word per issue. 10% discount for three or more consecutive issues. $5.00 minimum charge. Blind box in our care count nine extra words. Not subject agency commission.
- **DISPLAYED CLASSIFIED:** $20 a column inch one issue. 10% discount three or more consecutive issues. Minimum size one inch. Subject to agency commission.
- **All classified payable in advance.**
- **DEADLINE:** Copy to reach The Oil and Gas Journal not later that 9 a.m. on Wednesday preceding date of publication. **Send advertisements to: Classified Advertising Manager, THE OIL AND GAS JOURNAL, P. O. Box 1260, Tulsa 1, Oklahoma.**

EXCEPT . . .

WESTERN STATES: (California, Washington, Oregon, Idaho, Nevada, Utah, and Arizona). Write: Classified Departments, Inc., The Oil and Gas Journal, 4041 Marlton Ave., Los Angeles 8, Calif. Phone AXminister 2-0287. Copy deadline Monday noon.

FOR SALE EQUIPMENT

COMPLETE CASING pulling rig, Wilson Super, 7" x 8" x 65' mast, 7" x 5¼" jacks, tools to pull casing, tubing and rods. Box 426, El Dorado, Ark., Phone UN 3-7415.

ANOTHER LARGE AUCTION
WALCO DRILLING COMPANY

11920 South Main Street
Houston, Texas

TUESDAY, JULY 11, 1961 9:00 A.M. (CST)
Registration begins at 8:00 A.M.

This equipment may be inspected beginning JULY 1, 1961

WELL SERVICING UNIT

1—Franks Rocket Model 44DTD double drum unit with 65' tubular telescoping mast and all mounted on International tandem truck.

DRAWWORKS

1—Cardwell trailer-rig with 96' tubular type telescoping mast; all mounted.
1—Cardwell type O with automatic catheads and hydromatic brake.
1—Wilson Titan with automatic catheads and hydromatic brake.

MUD PUMPS

1—Gardner Denver 7¼" x 16" s/n 127646—Gardner Denver FXR 7¼" x 14" s/n 125217—Gardner Denver 7¼" x 14" FK-KXH-L powered by LRO Waukesha (pump s/n 748971) Emsco 7¼" x 14" B powered by LeRoi-Wilson Snyder 7P—7¼" x 12" powered by LRO Waukesha-Wilson Snyder 7¼" x 18"—18 P pump with drive.

DERRICKS

1—Lee C. Moore 98' mast with 10' pin type substructure—Oilwell 129' with 10' substructure—200,000 lb. capacity 96' 4-legged telescoping mast with 7' substructure.

ENGINES

2—6 WAKU81-6 gas butane equipped engines, 2—Waukesha 6 WAK gas butane equipped engines with starting engines—2—LeRoi RXIVW—12 cylinder gas butane equipped engines with starting engines.

OTHER EQUIPMENT

Rotary tables, swivels, blocks, drill and line pipe, weight indicators, tongs, slips, and elevators, kelly joints, drill collars, mud lines, air compressors, trailer house, steel tool houses, mud houses, bunk houses, oilfield trucks, blowout preventers, light plants, hand tools.

Hundreds of items too numerous to list.

For Detailed Listing Write For Brochure.

Wayne Cook Associates, Inc.

"The Nation's Leading Auctioneers"

193 Meadows Bldg. Dallas 6, Texas
Phone EM 3-3388

FOR SALE EQUIPMENT

CLARK MA-4 Gas Compressor, 150 HP, skid-mounted with radiator and accessories; 2 I.R. XVG6 Gas Compressors; 4225 HP Clark Centrifugal Compressor 9920 CFM 240 PSI discharge Pumps; Exchangers; Vessels. Brill Equipment Company, 4101 San Jacinto St., Houston 4, Texas.

Buying Good Used Equipment

is frequently the difference between having needed equipment or doing without it.

LIQUIDATION

at ESSO REFINERY Balto., Md.

MOST EQUIPMENT NEW 1956

TOWERS—30" to 84" diameter, 20' to 97' high, 7 to 34 trays, up to 360 PSI

DRUMS—3' to 12' diameter, 12' to 45' long to 530 PSI, some lined—some NEW

PETRO-CHEM FURNACES—30.7; 19.3; 10.4; 9.7; 7.5; 2MM BTU/Hr.

NEW FURNACE TUBES—4000'—⅜" & ½" Wall Croloy 5—4" to 6"

PUMPS—88 to 400 GPM up to 2040' head—up to 8 Stage

HEAT EXCHANGERS—CONDENSERS

Stainless Tubes	—235 to 2320 Sq. Ft.
Croloy 5 Tubes	—573 to 1040 Sq. Ft.
Admiralty Tubes	—216 to 1640 Sq. Ft.
Steel Tubes	—238 to 2240 Sq. Ft.

COMPRESSORS & BLOWERS

510CFM @ 500PSI Non-Lubricated 350 HP (3)
7500CFM @ 42.5PSIG, 1250HP Synch.

WRITE FOR CATALOG

HEAT & POWER CO., INC.

60 East 42nd St., New York 17, N. Y.
310 Thompson Bldg., Tulsa, Okla.
Boston & Haven St., Baltimore 24, Md.

FOR SALE EQUIPMENT

USED QUICK-CYCLE hydrocarbon Recovery and Gas Dehydration Units: 12MM to 30 MM SCFD capacities at 1000# W.P.—turnkey installation. Other used gas processing equipment available including gas dehyrators, glycol type. Two Used 10' x 22½' x 50# W.P. Emulsion Treaters with New 1.0 MM BTU/Hr. Firetubes and New Valves and Accessories. Engineered Specialties Co., Box 35683, Phone FL 1-5284, Dallas 35, Texas.

FOR SALE

2—Beaird Packaged Compressor Units 660 HP
1—Clark Compressor, 800 BHP, Model RA-8
1—Petro Chem Furnace, 1 MM BTU, New
1—U. S. Auto Jet Filter, 200 sq. ft. S/S

SNOW EQUIPMENT CO.
1700 Holcombe Blvd., Houston 25, Texas
JA 2-6359

AT N. LITTLE ROCK, ARKANSAS

3—Worthington #LTC-4 compressors, 3500 CFM @ 45 PSI, 24 x 15, 2-cyl., 500 HP, 4-cycle. gas-engine drive.

Phone POplar 3-3585

PERRY EQUIPMENT CORP.
1402 N. Sixth St.
Philadelphia 22, Pa.

One Vertical Direct Fired Water Heater

Radiant with separate convection section, 2.04 MM BTU/HR Heat Absorption Rating, 14,600 LBS/HR Charge Rate, 140° F. temperature differential, 95 PSIG Inlet Pressure, Series 300 ASA Flanges, Natural Gas Burner, ASTM-106B Sched. 40 Carbon Steel Tubes, 6'-0" OD x 10'-6" high to Bottom Stack.

One Vertical Convection Crude Oil Heater

Radiant Integral Two-Pass 5.35 MM BTU/HR Heat Absorption Rating, 135,310/11,181 LBS/HR Charge Rate of 21° API/18 M.W. Crude, 150/220° F. Inlet/Outlet Temperature, 102 PSIG Inlet Pressure, Ohio 1000 Series 850 Cleanout Headers, Natural Gas Burners, ASTM A-161 Carbon Steel Tubes, 7'-3" OD x 23'-0" high to Base of Stack.

NEW—Specially priced for immediate sale.

Address requests for prices or additional information to:

Box M-435, The Oil and Gas Journal
Tulsa, Oklahoma

LOCATED HOUSTON, TEXAS

(from Amoco Refinery Co., Destrehan, La.)

HEAT EXCHANGERS
50 to 4,000 sq. ft.
VESSELS—TOWERS
12" to 8' dia.
PETROCHEM FURNACES
½MM, 2½MM, 5MM BTU
PUMPS
50 to 7,000 GPM

—WIRE—PHONE—WRITE—

BRILL EQUIPMENT COMPANY
4101 SAN JACINTO ST., HOUSTON 4, TEXAS
25-28 JAMES STREET, NEWARK 5, N. J.

FOR SALE EQUIPMENT

ANOTHER LARGE AUCTION QUITTING BUSINESS

FRED McDUFF

OIL FIELD EQUIPMENT

Drilling Equipment, Engines, Drill Pipe and Collars, etc.

SEMINOLE, OKLAHOMA

Beginning Tuesday, July 18, 1961
at 9:00 A.M. (CST)
And Continuing Until Sold.

Sale Will Be Conducted On Fred McDuff's Yard on West Strother Street. Equipment May Be Inspected Anytime Beginning July 7 Until Time of Sale.

Everything Sells To The Highest Bidder Without Minimum or Reservation.

PARTIAL LIST

7—Drawworks; Wilson, Cardwell, Ideal, Oilwell, Portable Rig, Jones & Shelburne.
7—Mud Pumps; Wilson-Snyder, Bethlehem, Wheland, Oilwell, Gardner-Denver.
1—98' Mast.
2—Compounds; National 50, 2 Engine Compound.
25—Engines; LRO Waukesha, Buda, Cummins, Superior, Climax, Intl., Allis-Chalmers.
7—Rotarys; Ideco, Bethlehem, National, and Emsco.
7—Blocks; National and Other.
18—Sets Tongs; Wilson, Dunn, Webb-Wilson.
11—Swivels; Ideal National, Emsco, Oilwell, Gumbo Buster.
9—Drill Collars; 4", 5½", 5¾", 5⅜", 8".
Approximately 9,000' Drill Pipe; 3½" IF, 4½" API, 4" OD, 6⅝".
6—Kellys' 3½", 4½", 5".
9—Blow Out Preventers; Cameron, Shaffer, Oil Country Tool.
10—Set rams; 3½" to 7" Cameron and Shaffer.
3—Intl.; K-7, K-8, K-11.
1—Tandem Float.

Flanges—Adapters—Sub-structures—Welding Machines—Airguns & Hammers—Air Compressors—Hoists—Light Plants—Shale Shakers—Junk Baskets—Tanks—Tool Houses—Bales—Pipe Straighteners—Shop Tools—Steel Skids—Slips & Elevators. Hundreds of Miscellaneous Items, Too Numerous to Mention.

For Detailed Brochure Write

Wayne Cook Associates, Inc.

"The Nation's Leading Auctioneers"

193 Meadows Bldg.
Dallas, Texas

FOR SALE EQUIPMENT

FOR SALE: 2 Franks double drum units with Spudding attachments. All tools complete. Phone after 5:00 p.m. 1171. Jack Ekas, 110 W. Strothers, Seminole, Okla.

FOR SALE: Perforating Trucks with Logging Equipment. Will Sacrifice! All Offers Considered. Box M-467, The Oil and Gas Journal, Tulsa, Oklahoma.

SURPLUS PIPE FOR SALE

2900' 2⅞" Amer Open Hole Drill Pipe W/ 3⅞" Bottle Neck T. J. Inspected. 3500' 3½" I.F. Inspected W/ 4⅞" T. J. Square Shoulder. 11,000' 3½" I.F. Inspected W/ 4½" T. J. Bottle Neck. 4000' 4½" FULL & X Hole Inspected W/ 5⅞" T. J. Bargain Priced.

Write or Call
Don Herman Pipe Supply
Phone OR 7-4343 Oklahoma City, Okla.

FOR SALE
2,500 BBL. OIL REFINERY
Located Near Escanaba, Michigan

Unrestricted supply of western Canadian Crude Oil from Lakehead Pipeline. 25 acre site. 100,000 bbl. Storage Facility, Fractionating Tower, Naptha Tower, Asphalt Tower, Exchangers, Pumps, Piping, etc. Plant processed Gasoline and Fuel Oils. Facilities available for production of Asphalt, Naptha, Jet Fuel, etc.

VERY ATTRACTIVELY PRICED
Box M-454, The Oil and Gas Journal
Tulsa, Oklahoma

LIQUIDATION

at WHITING, IND.

Modern 15,000 BSD Fixed Bed HYDROFORMER

Must Remove At Once Will Be Sold As Units Or Piecemeal

3—Steam Driven GAS COMPRESSORS
2495 CFM 205 PSI Discharge
3—Steam Driven
RECYCLE GAS COMPRESSORS
11840 CFM 325 PSI Discharge
1—Electric Driven AIR COMPRESSOR
2760 CFM 325 PSI Discharge 800 HP

DRUMS
8' x 30' 222 PSI Design
6' x 15' 342 PSI Design
6' x 22' 1260 PSI Design

TOWERS
8' x 63'—18 tray 390 PSI
7' x 83'—30 tray 342 PSI
4' x 83'—34 tray 222 PSI

PUMPS—EXCHANGERS VESSELS

Write for Inventory
Send Us Your Requirements

HEAT & POWER CO., INC.
60 East 42nd St., New York 17, N. Y.
310 Thompson Bldg., Tulsa, Okla.

FOR SALE EQUIPMENT

3 BIGELOW BOILERS, Scotch type, 200 pounds working pressure, horizontal, complete with all controls. In service approximately five years. Steel frame boiler building, 82' long by 32' wide. Direct inquiries or bids to Box M-455, The Oil and Gas Journal, Tulsa, Oklahoma.

TUBING AND ROD MACHINE. Cooper unit. Allis Chalmers engine mounted on 1955 Chevrolet two-ton truck. 7" and 8" pole. Vacuum controlled. All new in 1955. Truck has 11,800 miles. $4,700. Phone 80, Jamison Pipe and Tool, Madison, Kansas.

FAILING 1500, truck mounted, complete with air compressor and service truck. Also, Star 45 spudder, rated 4500'. Prices right. Pressey & Son. Pueblo, Colorado.

AN INVESTMENT! Productive advertising is an investment rather than an expenditure. Experienced oil men have found that The Oil and Gas Journal is their best classified advertising medium.

WILL SACRIFICE! All offers considered. 800 HP Worthington, LTS Compressor. Box M-381, The Oil and Gas Journal, Tulsa, Oklahoma.

1—TYPE 10 BESSEMER Twin with late type 17" power cylinders, Two stage compressor. 1—Type 10 Bessemer single with late type 17" Power Cylinders, Two stage tandem. Wescott-Greis meters, back pressure regulators and meter setting. All in excellent condition. Thomas Drilling Co., Inc., First National Bank Building, Holdenville, Oklahoma.

DRILLING RIG for sale to highest bidder, Unit Rig U-15 with Hydromatic brake and feed control, 127 foot Lee C. Moore Cantilever Mast, 4" O.D. drill pipe, etc. Inventory list will be mailed together with bidding instructions upon request. All bids must be post market not later than July 17, 1961. Shell Oil Company, P. O. Box 1509, Midland, Texas, Attn: Mr. J. W. Benn.

Sales—GAS COMPRESSORS—Rentals
Save 25% to 40% over new price
Used 30 h.p. to 300 h.p.—Guaranteed
New and Rebuilt Gas Engines
INDEPENDENT FIELD SERVICE, INC.
503 Monigomery St., Shreveport, La.
Phone 425-9497

EQUIPMENT WANTED

WANTED . . .

8" and 10" Used or New Surplus Steel Pipe Couplings; 8-Thread; with or without dutchmen. Any quantity; any area. Immediate inspection and quick pick-up with our own trucks.

Write—Wire or Phone "COLLECT."

DAVID CRANCER
PRospect 3-3020

VALLEY STEEL PRODUCTS CO.
124 Sidney St. St. Louis 4, Mo.

HELP WANTED

PROCESS ENGINEER. Experienced in Petrochemicals, Alkylation, Cat-reforming, Cat-cracking and other refining units. Refinery located in Midwest. Box M-468, The Oil and Gas Journal, Tulsa, Oklahoma.

POSITIONS OPEN for superintendent, chief operator, chief repairman, and chief clerk for new natural gasoline plant under construction at Lignite, North Dakota. Reply to The TXL Oil Corporation, 3100 Fidelity Union Tower, Dallas 1, Texas.

HELP WANTED

OIL JOB DIRECTORY, foreign and domestic, showing where to apply for jobs. $5.00 cash OIML Co., Box 2603, Tulsa, Oklahoma.

NATURAL GAS Engineer with engineering degree plus 3 to 5 years experince in plant design or operation for work in the Gulf Coast Area. Amerada Petroleum Corp., Gas Department, P. O. Box 2040, Tulsa, Oklahoma.

GEOLOGIST—For Houston Independent. Must have good experience South Louisiana and Texas Gulf Coast and willing hard work both field and office. Salary $10,000 plus benefits. Send resume and photo to Box M-444, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER for sales work. Houston Manufacturer of gas lift and oilfield production equipment. Give resume of experience. Our employees know of this ad. Box M-418, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED PETROLEUM Engineer or first class field man who knows production and normal field operations. This job is far above average and compensation far above expectation. Furnish complete resume. Box M-443, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED ELECTRICAL-Instrument Engineer for large midwest refinery. Must be qualified to develop and engineer electronic control systems. Send complete resume including salary requirements to: Box M-442, The Oil and Gas Journal, Tulsa, Oklahoma.

Chemical Engineer

for challenging work in petroleum refining, petrochemicals, process control, and trouble-shooting. Opportunities for supervision. Excellent working conditions and employee benefits, in a large progressive oil refinery. Up to ten years' experience. Write:

Employee Relations Department
TIDEWATER OIL COMPANY
Delaware City, Delaware

CHIEF PROCESS ENGINEER

Clark Oil & Refining Corp., has opening for Chief Process Engineer. Must have B.S. or M.S. in Chemical Engineering and varied experience in process calculations. General knowledge and understanding of Cat Cracking, Alkylation, Platforming, and utilities desirable. Send complete resume, including salary requirements to:

CLARK OIL & REFINING CORP.
P. O. Box 297
Blue Island, Illinois

CHEMICAL ENGINEER

Petroleum refinery process engineer with minimum of three years experience. Ability to evaluate raw charge feed stocks and blend finished products. Salary open with excellent fringe benefits. Long established independent refinery located in major center of Louisiana. Our employees know of this ad. Submit complete resume of experience, education and salary requirements. Write:

Box M-459, The Oil and Gas Journal
Tulsa, Oklahoma

SITUATIONS WANTED

ENGINEER: GEOLOGICAL, 9 years in East and South Texas, diversified experience, production geology, reservoir engineering, drilling and development, and production engineering. Box M-451, The Oil and Gas Journal, Tulsa, Oklahoma.

PILOT SERVICE. Age 40. Multi-engine aircraft available. Helicopter rating. Free to travel any location. Experience in oil production leasing, construction work, and electronic surveys. Box M-460, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER—Oklahoma University graduate, seven years major company experience including reservoir and evaluation engineering, waterflooding, automation and production practices. Familiar with Oklahoma, North Texas, Gulf Coast and Kansas operations. Complete resume upon request. Box M-456, The Oil and Gas Journal, Tulsa, Oklahoma.

RECENT COLLEGE graduate B.S., 28, married, five years experience on two gas pipelines for one major company. Desires position offering challenge and responsibility. Foreign work welcomed. Box M-457, The Oil and Gas Journal, Tulsa, Oklahoma.

SECONDHAND GEOLOGIST—Used only 12 years. A-1 condition. Years of good service remaining. For road record and maintainance cost write: Box M-458, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST, 33 years, married, employed. Desires permanent situation. 10 years experience includes initiation, supervision and interpretation of seismic programs in close association with geologists. Extensive field experience. Box M-461, The Oil and Gas Journal Tulsa, Oklahoma.

GEOLOGIST & Petroleum engineer. Cal Tech graduate. California registration. Desires Operations research or evaluation position. Box 31 Q 10, The Oil and Gas Journal, 4041 Marlton Ave., Los Angeles 8, Calif.

PALEONTOLOGIST, 44, single, desires overseas position with oil company. 15 years experience with Tertiary and Cretaceous Foraminifera, and ammonites, in California, Colombia and Libya. Some field and wellsite work. Knows Spanish, learning Arabic. Box M-465, The Oil and Gas Journal, Tulsa, Oklahoma.

ACCOUNTING SUPERVISOR
Twenty years responsible and diversified experience with independent. Willing to relocate in Montana, Wyoming, Colorado or South Dakota with oil company offering opportunities for advancement. For personal resume write: Box M-434, The Oil and Gas Journal, Tulsa, Oklahoma.

ELECTRICAL ENGINEER: 35, ten years pipeline station electrical and control design, construction, and startup, foreign and domestic. Box M-397, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST 31, M.S. 1960. Ten years diversified electronic experience while working my way through college. Interested in becoming associated with the oil industry. Free to travel or move anywhere. Complete resume sent upon request. P. O. Box 861, Richardson, Texas.

GEOPHYSICIST
Wide experience seismic interpretation and program supervision. Domestic assignment preferred. Box M-437, The Oil and Gas Journal, Tulsa, Oklahoma.

MANAGE YOUR PRODUCTION, evaluations, and drilling activities anywhere in US from my office in Wichita, Kansas. Will offer complete accounting, legal, geological, banking, labor, and supervisory facilities for your needs. Thirty-four year licensed professional petroleum engineer with consulting and major experience from Gulf through Nebraska. Would consider personal employment contract if headquartered in Wichita. Box M-448, The Oil and Gas Journal, Tulsa, Oklahoma.

REGISTERED PETROLEUM Engineer, Saskatchewan and Illinois, B.S. degree University of Pgh., age 41, married, two children. Eighteen years diversified experience in production, reservoir and evaluation engineering, drilling and completion. Last five years served as chief engineer for major oil company in Saskatchewan. Have had experience in Illinois basin and Michigan. Desires position with independent or financial group. Will relocate anywhere in USA, Canada, or Alaska. Above average academic and professional background. Complete resume upon request. Box M-445, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

PETROLEUM ENGINEER—Production manager, seventeen years experience drilling, production, oil and gas property evaluation, reservoir engineering, administration and management. B.S. degree Petroleum Engineering, LL.B degree Law. Complete resume on request. Box M-466, The Oil and Gas Journal, Tulsa, Oklahoma.

PROCESS INSTRUMENTATION & Controls Engineer—B. Chem. Eng. 1950. 10 Years instrumentation experience in chemical industry. Combines knowledge of process, instrumentation hardware and control theory. Position developing advanced process control systems with petroleum refinery or petrochemical process or organizing control systems group. Write Box M-463. The Oil and Gas Journal, Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

WANTED OIL and Gas production and producing royalties. All data must be furnished for quick answers. Kenmo Oil Company, 1404 Perry Street, Des Plaines, Illinois.

TWO UNTESTED oil structures, One in Central and one in Western Montana. Open for leasing. For Particulars write: O. A. Moen, Bigfork, Montana.

TEN YEAR LEASES—5,000—15,000 acre Blocks—good play areas. Ohio-West Virginia Production. Box 393, Marietta, Ohio. Phone 373-6862.

NEBRASKA ACREAGE available. Selected blocks in major company areas on Chadron Arch play. P. O. Box 1527, Durango, Colorado.

PROSPECTIVE OIL LEASES: Am fee landowner over 2,000 acres near Pan American Petroleum Corporation No. 1 List, Sec. 23, Block 68, Township 1, T&P Survey, stratigraphic test, projected to 8,500 feet. anticlinal axis nearby, Hudspeth County, Texas, leases available Hudspeth, Crane, Terrell Counties, Texas. Write landowner: Jefferson G. Smith, 715 Littlefield Building, Austin 15, Texas.

DO YOU HAVE A LEASE TO SELL? For as little as $5 per week you can tell your proposition to over 45,000 oil men through The Journal's classified advertising pages. You'll be surprised how many are interested.

HAVE 100,000 ACRES of Ohio and West Virginia Oil and Gas Leases in Appalachin Basin Area for immediate sale in the Multa Million acre lease play scattered in and through major companies holdings, specializing in 50 to 60 thousand acre blocks. David Law, 716 Union Trust Building, Parkersburg, West Virginia.

PRODUCTION, 100 acres, 2 Tar Springs Wells, Butler County, Kentucky. Take 190D Mercedes and cash or H. J. or K35 Beech. 395 acre block, 80 acres held by production, 10-9S-7E, 4 miles South Eldorado, Illinois. Good prospect from Palestine thru McCloskey. Take cash or interest in well. George M. Robertson, Harrisburg, Illinois.

APPALACHIAN NATURAL GAS PROSPECT
9,000 acre lease block immediately off-set by major company holdings. Commercial five to twenty year leases. Yearly rental of $.50 per acre paid quarterly in advance. Active leasing area. Thorough geological report prepared by eminent Appalachian geologist available on request. Principals only. Kindly reply on Individual or Company letterhead. Box M-447, The Oil and Gas Journal, Tulsa, Oklahoma.

Will sell a few "several thousand acre checkerboards" of leases in various areas in Pennsylvania and Ohio where seller will promptly test Oriskany, Holderberg, Medina and deeper formations—no pro-ration—ready market @ 27 cents per M.C.F. Seller willing to participate in drilling deals with responsible buyers. Excellent success record of seller includes recent significant Oriskany gas pool discovery in Ashtabula County, Ohio and "Shearer Oil Pool" discovery in Coshocton County, Ohio in 1952. Write to:
James I. Shearer, President, James Drilling Corporation
250 Newport Road, Blairsville, Pennsylvania

Gas lease 386.1 acres $772.20 yearly has active storage thereon, also has considerable pulp wood. Another lease pays $680 yearly, no well, but good prospect, has some pulp wood. Near large east-west pipeline, located in Sabinsville Pa. Field. Old age only reason for selling. J. D. Trimmer, Wellsville, N.Y.

LEASE AND DRILLING BLOCKS

SINGLE 8,000 ACRE lease to sell, Lawrence Co., Ohio. Wildcat Acreage. One well cures. Particulars upon request. R. B. Weed Consulting Geologist 1500 W. 3rd Ave. Columbus, Ohio.

WATER FLOOD PROSPECTS WANTED Active Oklahoma independent desires to purchase good water flood prospects located anywhere in the Mid-Continent area. Box M-453, The Oil and Gas Journal, Tulsa, Oklahoma.

SOUTH TEXAS AND GULF COAST LEASES WANTED
Active independent desires South Texas and Gulf Coast close in oil and gas drilling prospects. Immediate action on submittal of full information. Box M-452, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR LEASE 78 acres Gas/Oil. Lake Erie field, Ashtabula Co. Producing wells both oil/gas. R. R. Rice, Lockwood, Ohio. Phone Greene H-19.

UTAH GRAND County, 640 acres T 20 S: R 26 E:, 80 acres T 20S R 20E:, Kane County 640 acres 40S: 5W. Write S. L. Moore, 410 Marshall Street, San Antonio, Texas.

WYOMING, NATRONA County 240 acres Federal lease-Sec. 23, T 29N. R 83. Michael Fanakos, Box 73, Villa Grove, Illinois.

LEASE FOR SALE: 160 acres Carbon County, Wyoming T 21N, R. 83W., Sec. 30, SE¼, issued Dec. 1, 1957. Box M-464, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL AND GAS Lease Available, Sections 561 also 621, John H. Gibson Survey, Block D. Yoakum County, Texas. L. J. Luedecke, 1715 Cromwell Hill, Austin, Texas.

LEASE FOR SALE: 6 active wells. Good production. Warren County, Kentucky. Write Box M-462, The Oil and Gas Journal, Tulsa, Oklahoma.

SERVICES

COMPLETE LEASE and title service. J. A. Buchanan, P. O. Box 1344, 313 Peoples National Bank Bldg., Tyler, Texas.

BUSINESS SERVICE

DELAWARE CORPORATION formed and serviced American Guaranty & Trust Company. P. O. Box 487, Wilmington, Delaware.

SELECTED RECOMMENDATIONS for the monthly filing of Federal simultaneous oil and gas leases available. Geological and Leasing Associates, Inc., P. O. Box 1194, Denver 1, Colorado.

ROYALTIES

ROYALTIES FOR SALE in small tracts in Beckham, Kay, Lincoln, Roger Mills and Woods Counties All in Oklahoma. P. O. Box 813, Oklahoma City, Oklahoma.

MONEY RAISING

WANTED—CAPITAL to help develop a 25 million dollar placer gold mine. Qualified Engineer's report available to interested parties. C. L. Craig, Box 790, Plainview, Tex.

BUSINESS OPPORTUNITIES

FINANCIAL—Investment Banking Houses and Underwriters reached. Confidential. You can send the details of your proposition direct or thru your attorney to Consultant 817—51st Street, Brooklyn, N. Y.

LARGE DEPOSIT snow white silica 99.05% pure. Deposit extremely soft Phos-Lime market assured thru national concern. Also shallow oil situation 17 M b/p/a. Box 143, Bentonville, Arkansas.

HAVE YOU BEEN seeking financial help and losing so much of your time and not getting any place? Our diversified services will furnish you with a long list of potential oil and gas interest investors. Kenmo Oil Company, 1404 Perry Street, Des Plaines, Illinois.

$3,000,000.00

Copper deposit, New Mexico, recoverable by "in-place" water leaching (process similar to secondary recovery of oil by water flooding). Will assign half interest in property in exchange for $5,000. to install leaching plant (less if you have used pipe and small water pumps available). Write for report describing property. Zweifel, Freeman & Zweifel, Fonshowe, Oklahoma.

▶▶▶ Personals

(Continued from Page 257)

as exploration staff assistant to the senior vice president of Standard Oil Co. (Ohio), the parent company. **Alvin E. Hall,** assistant chief engineer for Sohio Petroleum, will succeed Young in Oklahoma City.

J. E. Miller, head of oil conservation at Humble's Baton Rouge refinery, has been named coordinator of loss and pollution control for the chemical-products and petroleum-products divisions.

Richard D. Buck, Oklahoma City, has taken over the drilling equipment of Berg & Buck Drilling Co., Shawnee, Okla. The company was dissolved after the recent retirement of **Theo Berg.**

Hy Seiden has left Standard Oil Co. of California to open offices as consulting geologist in Bakersfield, Calif. He had been with California Standard since 1952.

James L. Wible has joined Jersey Production Research Co.'s drilling and development-research division as a senior research engineer. **Walter Drost-Hansen** has joined the company as senior research chemist in the production-research division.

Barry McHugh, senior land man for Mobil Oil of Canada, Calgary, has joined Scurry-Rainbow Oil, Ltd., as assistant land manager.

E. F. Curry, assistant department head, lube finishing, at Humble's Baton Rouge refinery, has been given a loan assignment with Esso Nederland, NV. **D. B. Hile** will take over Curry's duties at Baton Rouge and will continue as assistant head of the lubricants and wax section.

Gary B. McCreary, geologist with California Co. in New Orleans, has been transferred to Houma, La., as geological observer.

George M. Dixon, general manager of Dansk Veedol, Tidewater's Danish subsidiary, has been named manager of Tidewater's western division trade relations. He will headquarter in San Francisco. Dixon had held the Danish post for 2 years before his recent return to the U. S.

John O. Collins has been named research associate by Esso Research & Engineering Co.

John B. Kane, sales manager for Signal Oil & Gas Co.'s Houston division, has joined La Gloria Oil & Gas Co. as manager of wholesale sales. He will headquarter in Houston.

J. Rawles Fulgham, Jr., loan officer in the oil-loans department of First National Bank in Dallas, has been elected a vice president of the bank.

Fred F. Kriftewirth, plant operator for General American Oil Co. of Texas, has joined Home Stake Production Co. as foreman in Leon, Kans.

Alan M. Dobry, Peter Fotis, Jr., and **Thomas D. Nevitt** have been named senior research scientists in American Oil Co.'s Whiting, Ind., research laboratories. New senior project chemists at Whiting are **Eli W. Blaha, Joseph M. Sandri,** and **Edward A. Swakon. Nicky Beredjick, Johannes H. Klauwers,** and **John H. Udelhofen** have been named project chemists, Whiting.

Donald M. James has joined California Research Corp.'s La Habra, Calif., laboratory as research engineer. Joining Cal Research at the Richmond, Calif., lab are **Raymond D. Szidon,** research chemist in analytical and physical measurements; **Robert H. Church,** research engineer in refinery technical-service; and **Flora J. Sick,** research mathematician.

F. G. Turpin has been given a year's exchange assignment as process superintendent in charge of cracking and light ends at Humble's Baytown, Tex., refinery. He succeeds **D. A. Smith,** who will fill Turpin's post as assistant head of the chemical-products division at the Baton Rouge refinery. The exchange assignments take effect in August.

ADVERTISERS

. . . in this issue

Air Reduction Sale Company 204, 205
Ajax Iron Works 15
Aluminum Co. of America 221, 223, 225, 227
Allis Co., The Louis 44
American Meter Company 189
Amot Controls Corporation 102, 196
Arcco Instrument Company, Inc. 200
Associated Electrical Industries Export, Ltd. 32
Atlas Bradford Company 246, 247
Avondale Shipyards Inc. 236

Baker Oil Tools, Inc. 112
Bank of the Southwest 21
Barton Instrument Corporation 219
Bethlehem Steel Company 2
Supply Division 78, 79
Black, Sivalls & Bryson, Inc. 83
BrakeSol, Inc. 102
Brown & Root, Inc. 155
Burden Construction Corp., O. R. 196

Cameron Iron Works, Inc. 76, 77
Catawissa Valve & Fittings Co. 197
C-B Southern, A Division of the Cooper-Bessemer Corporation 58
Chance Co., A. B. 197
Chicago Pneumatic 232, 233
Christensen Diamond Products 82
Clark Bros. Co. One of the Dresser Industries 100, 101
Classified Advertising 263, 264, 265, 266
Colorado Fuel and Iron Corp. 68
Continental-Emsco Company, a Division of the Youngstown Sheet and Tube Company 137
Continental Illinois National Bank and Trust Co. of Chicago 173
Cook Company, C. Lee 47
Cooper-Bessemer Corp., The 24, 25
Crane Perrault Equipment Corp. 202
Crouse-Hinds Company 6
Crutcher-Rolfs-Cummings, Inc. 190

Daniel Orifice Fitting Company 222
Darling Valve and Mfg. Co. 65
Davison Chemical Company Division of W. R. Grace & Co. 62
Delta Air Lines 209
Detroit Diesel Engine Division, General Motors 80, 81
Dominion Bridge Company Limited 220
Dorr-Oliver Incorporated 110, 111
Dover Corporation, W. C. Norris Division 253
Dowell ..... 13, 217, Inside Back Cover
Dresser Manufacturing Division 213
Drilling Equipment Manufacturing Co. 250
Durhron Company, Inc., The 179

Fenix & Scisson, Inc. 196
First City National Bank of Houston 252
First National Bank & Trust Co. of Tulsa 245
Foster Wheeler Corporation 27
Foxboro Company, The 12
Fulton & Company, R. H. 210, 211

Gaso Pump & Burner Mfg. Co. 95
Gates Rubber Co., The 103
General American Transportation Corporation 4
Geotronic Survey Company 242
Goodrich Industrial Products Co., B. F. 3
Grace & Co., W. R.—Davison Chemical Division 62
Granberg Corporation 195
Griscom-Russell Co., The 75
Grove Valve and Regulator Company 89
Gulberson Corporation 39

Haering & Co., Inc. D. W. 192
Halliburton Company 7, 235
Harbison-Fischer Mfg. Co. 99
Hold That River! Engineering Co. 209
Houdry Process Corporation 180
Houston Contracting Company 198
Hudson Engineering Corporation 106
Hughes Tool Co. ..... Back Cover
Humble Oil & Refining Co. 90

Ingersoll-Rand 96, 97

Jenkins Bros. 167
Jones & Laughlin Steel Corporation 186, 187
Jones & Laughlin Supply Division 8, 9
Jones Company, The S. M. 226
Joy Manufacturing Company 52

Kellogg Co., The M. W. 170, 171
Kemp Mfg. Co., C. M. 48
Koenig Iron Works, Inc. 234
Koppers Company, Inc., Tar Products Division 45

Larker Packer Company, Division of Koehring Company 63
Leland Equipment Company 104
Line Scale Division, Little Giant Corporation 222
Link-Belt Company 94
Lone Star Cement Corporation 1
Lone Star Steel Company 174, 175
Lufkin Rule Co., The 214
Lunkenheimer Co., The 31

Macwhyte Wire Rope Company 20
Magnet Cove Barium Corp. 26
Majestic Contractors, Inc. 194
Maloney-Crawford 203
Manning, Maxwell & Moore, Inc. 41
Marsh Instrument Company, Division of Colorado Oil & Gas Corporation 56
Martin, Manufacturer, John N. 102
McDonough Marine Service 196
Mercoid Corporation, The 213
Mid-America Pipeline Company 188
Midwest Piping Company, Inc. 43
Minneapolis-Honeywell Regulator Co., Industrial Division 72, 73
Mission Mfg. Company 218
Mixing Equipment Co., Inc. 224
Monsanto Chemical Company, Inorganic Chemical Division 156
Motorola Communication & Electronics, Inc. 71

Nalco Chemical Company 67
Nash Engineering Co. 28
National Supply Division, Subsidiary of Armco Steel Corporation 33, 34, 35, 36
National Tank Company 268
National Tube Division 159
Nicolet Industries, Inc. 182
Nordberg Mfg. Co. 201, 203, 205, 207
Norris, W. C., Division of Dover Corporation 253
Northwest Engineering Company 46

Ohio Injector Company 49
Oil Center Tool Co. 42
Oil Metering and Processing Equipment Corp. 216
Oil States Rubber Company 217
Oil Well Supply Division 91, 92, 93
Olin Mathieson Chemical Corporation, Chemicals Division 29

Paris Distributor, Inc., Henry H. 189
Peerless Manufacturing Co. 30
Petroleum Distributing Company 234
Petroleum Electric Power Assn. 50
Phillips Chemical Company, A Subsidiary of Phillips Petroleum Company 5
Pittsburgh-Des Moines Steel Company 11
Pittsburgh Plate Glass Company 86
Pittsburgh Steel Company 16, 17
Polyken Sales Division, The Kendall Company 206, 207
Precision Scientific Development Company 181
Procon Incorporated 57

Radio Corporation of America 163
Reed Roller Bit Company 105
Reilly Tar & Chemical Corp. 185
Republic Supply Company, A Subsidiary of Republic Steel 208
Rockland Industries, Inc., Chemical Division 191
Rockwell Manufacturing Company ..... Inside Front Cover

Schlumberger Well Surveying Corp. 251
Scott-Rice Company 234
Sheehan Pipe Line Construction Co. 212
SIE Division of the Dresser Industries 10
Smith Corporation, A. O.—Meter, Service Station Pump, Divisions 84, 85
Snap-Tite, Inc. 66
Solar Aircraft Company 114
Square D Company 59
Stewart & Stevenson Services, Inc. 230, 231
Stone & Webster Engineering Corporation 69
Strahman Valves, Inc. 191
Stupp Corporation 51
Sumitomo Metals Industries, Ltd. 53

Taylor Instrument Companies 64
Texas Instruments Incorporated—Industrial Instrumentation Division 184
Tex-Tube Inc. 108
Thomas Flexible Coupling Co. 244
Thornhill-Craver Co. 14
Toledo Pipe Threading Machine Co., The 190
Tretolite Company, A Division of Petrolite Corporation 54
Tube Turns, Division of Chemetron Corporation 238, 239

Union Switch & Signal, Division of Westinghouse Air Brake Company 40
Union Wire Rope, Armco Steel Corporation 60, 61
Unit Crane & Shovel Corp. 194
United States Steel Corporation—National Tube Division 159
Oil Well Supply Division 91, 92, 93

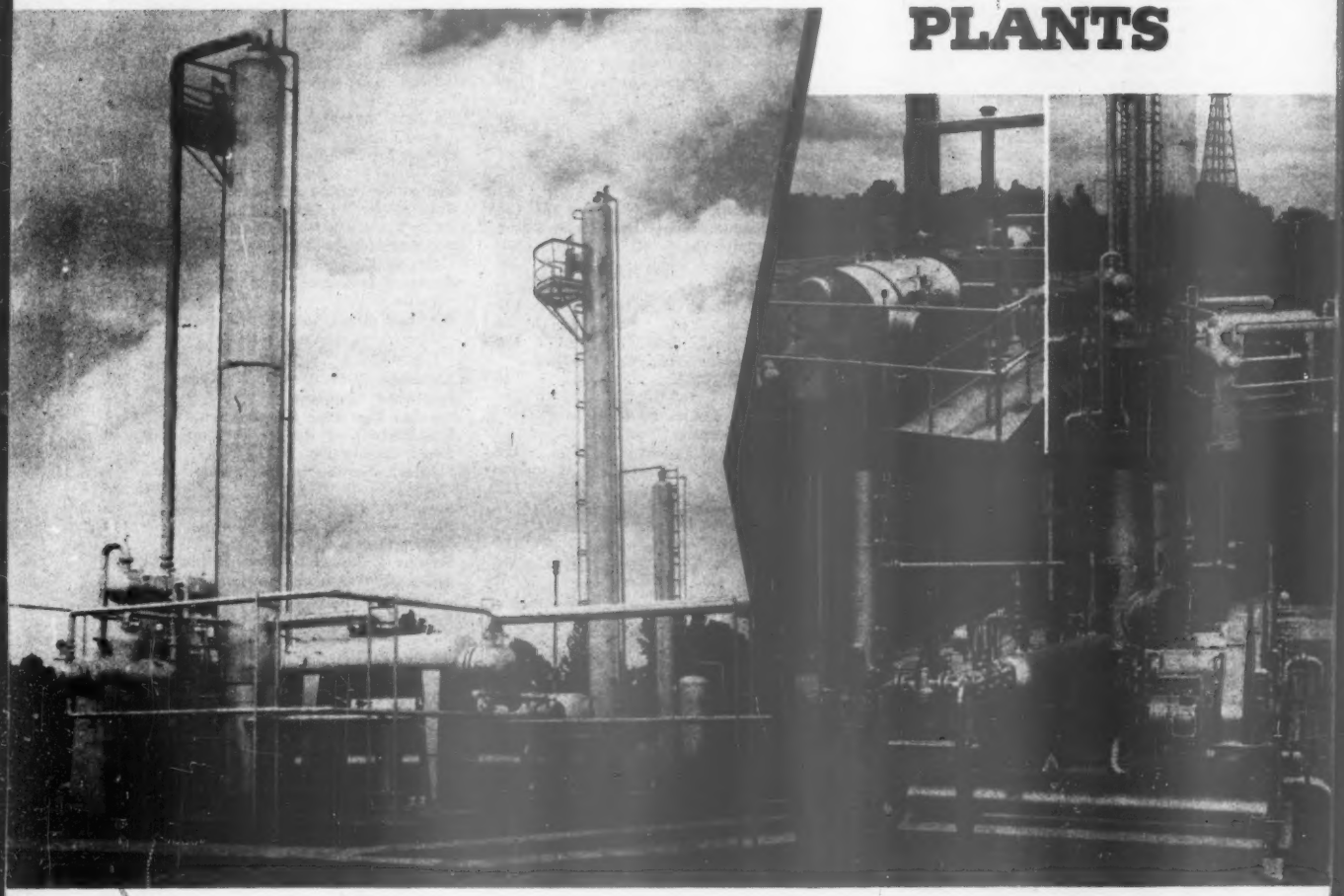
Vapor Recovery Systems Co., The 74
Victaulic Co. of America 199
Vogt Machine Co., Henry 38

Waukesha Motor Company 70
Wedgeplug Valve Company, Division of Stockham Valves and Fittings 22
Western Supply Company 19
White Diesel Engine Division, The White Motor Company 18
Williams & Co., J. H. 23
Williamson, Inc., T. D. 193
Willys Motors, Inc. 37
Wilson Manufacturing Company 216
Wolverine Tube Division of the Calumet Hecla, Inc. 87, 88
Worthington Corporation 55
Wyandotte Chemical 107

Young Radiator Company 184

NATIONAL®

MONOETHANOLAMINE PLANTS



Acid gas removal from a 3,500 mfc feed stream containing about 10% H_2S and CO_2 is accomplished in this National M.E.A. Plant—COMPLETELY AUTOMATED FOR UNATTENDED OPERATION!

The unit, in Southern Arkansas, is built in conjunction with a National Glycol Dehydration Unit.

The plant contains 13 automatic safety shutdown points—shuts off wells, shuts down fuel, switches gas to flare, signals personnel three miles away in case of abnormal operation.

COMPLETE DESIGN, PACKAGED FABRICATION, DELIVERY, ERECTION AND START-UP BY NATIONAL.

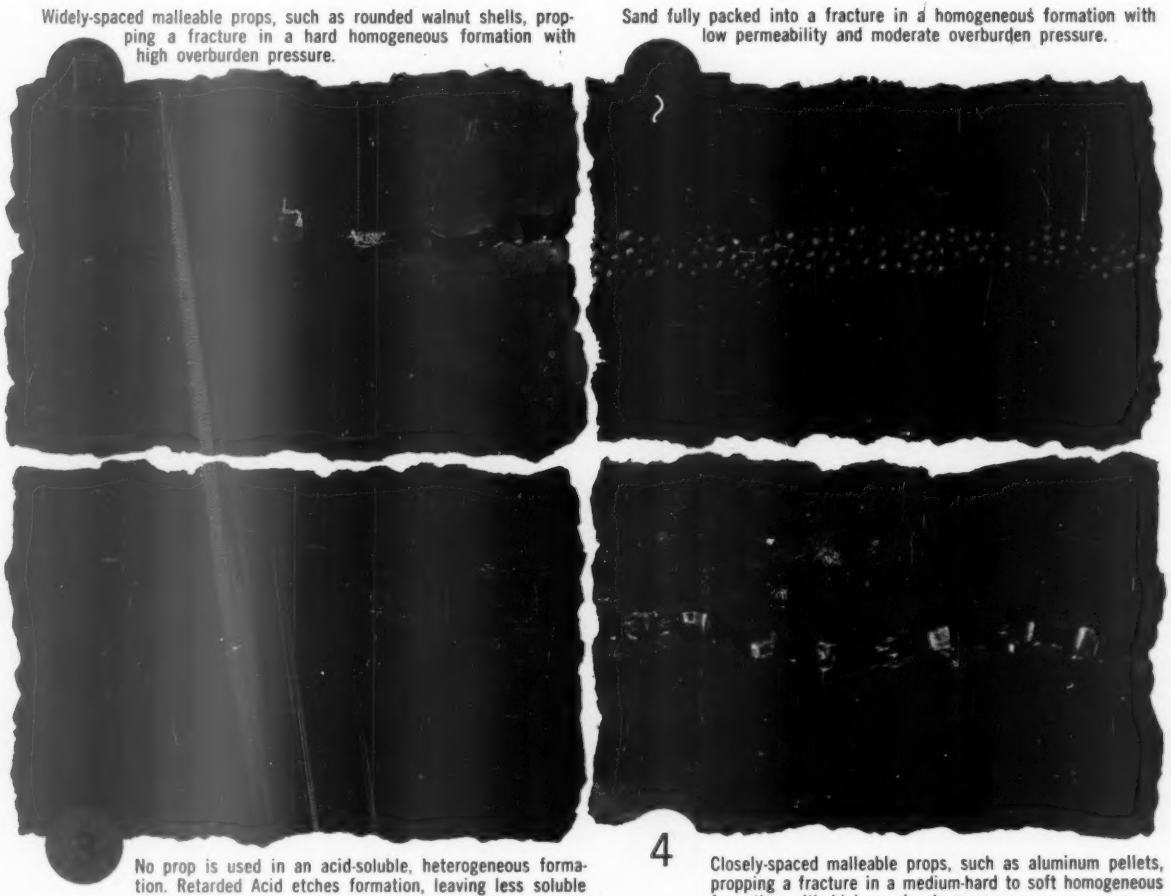
When you need a custom-designed, custom-fabricated, unitized plant for field processing of oil and natural gas, specify National.

It's a National®

NATIONAL TANK COMPANY

DRAWER 1710

TULSA, OKLAHOMA



Widely-spaced malleable props, such as rounded walnut shells, propping a fracture in a hard homogeneous formation with high overburden pressure.

Sand fully packed into a fracture in a homogeneous formation with low permeability and moderate overburden pressure.

No prop is used in an acid-soluble, heterogeneous formation. Retarded Acid etches formation, leaving less soluble portions as prop.

4

Closely-spaced malleable props, such as aluminum pellets, propping a fracture in a medium-hard to soft homogeneous formation with high overburden pressure.

fracture conductivity tests help operators select most profitable stimulation treatments

For more than a year, Dowell laboratories have been measuring and compiling data on flow capacities of fractures in various formations. The effects of different fracturing fluids and propping agents on fracture conductivity are compared. The illustrations here show four examples of fracture props that are frequently checked.

Flow capacity data from these tests — plus other pertinent well information — are interpreted through the Frac Guide* by Dowell engineers to help design the most profitable fracturing treatments for you.

In many cases, operators have realized much faster payouts than had been recognized as normal for a field. In some instances, Dowell has helped operators avoid many unprofitable jobs. In most cases, average profits have been increased over previously accepted norms.

In designing a stimulation treatment, it is best to test actual cores from your well. However, if cores are not available, cuttings can often be used. These cuttings are compared for similarity with the numerous cores already tested and cataloged by Dowell.

Ask your Dowell representative for a free copy of the new "Technical Report on Fracture Conductivity." It deals with such factors as size, type and amount of propping agent, hardness of formation and overburden pressure.

The fracture conductivity testing program is another important step in Dowell's continuing research and service program to help you make more profits. Dowell services and products are offered in North and South America, Europe and North Africa. Dowell, Tulsa 1, Oklahoma.

*DOWELL SERVICE MARK

SERVICES FOR THE OIL & GAS INDUSTRY

DIVISION OF THE DOW CHEMICAL COMPANY

Will your drilling string return a profit?

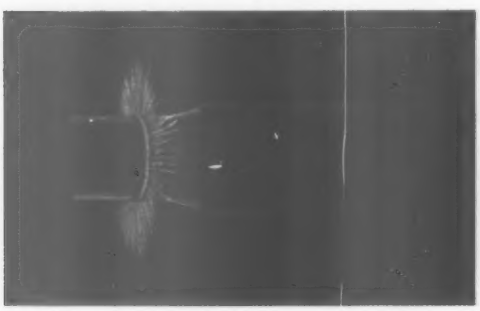
When you invest $40,000, $60,000 or $75,000 for a drilling string, you want to be sure that it will return a profit through long, dependable, trouble-free service.

The one sure way of getting profitable footage out of your drilling string is to specify tool joints with a *proven performance* record. Hughes "Flash-Weld" joints have that kind of a record.

> "Flash-Weld" construction was developed by Hughes. In 23 years, Hughes "Flash-Weld" joints have been used in unitizing more than 46 million feet of drill pipe. No other tool joint construction has that experience behind it.

What is more important, as drilling has gone deeper and operating conditions have become more severe, Hughes has *continued* to improve its "Flash-Weld" construction and hardfacing. As an example, an induction heat treating process — *developed by Hughes and used 100% on all welds* — is doubling the tension-impact strength of Hughes "Flash-Weld" connections.

Get the most out of your drill stem dollars by specifying Hughes "Flash-Weld" tool joints . . . your most dependable and economical tool joint-to-pipe connection.



FLASH-WELD
A DEVELOPMENT
OF
HUGHES
TOOL COMPANY
HOUSTON, TEXAS